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**Illustrated.*

The New Year

In beginning 1910 we have an opportunity to talk to our readers that does not often occur—we mean to talk about some intimate matters. Ordinarily the first issue of the year is the statistical number, reviewing the previous year, and however large this is planned to be there turns out always to be a large surplus of material in type and a reluctant casting aside of some of it. So the New Year number is not only historically overcrowded, but also it seems to be inappropriate to inject anything but its special character of matter, and by the next issue the impulse that comes upon opening a new volume is gone. This year the first Saturday falls on Jan. 1. Although Saturday is nominally our day of publication the paper is out on Friday, usually in the morning, and inasmuch as we do no night work in our printery the forms have to be closed on Wednesday, which in this case was Dec. 29, obviously too early to complete the collection of our statistics.

We may pause for a moment to say a word about statistics. Formerly our industries were perpetually in the dark. Such statistics as were collected were so belated in appearance that they had only historical value. In order to help its readers the JOURNAL was inspired about 25 years ago to inaugurate its own collection and prompt publication, believing that figures within 5 per cent. of the truth right at the end of the year were vastly more valuable commercially than precise figures a year or two late. Our long campaign for prompt and reliable information has borne fruit and relieved us of much investigation.

The improvement in statistical information is but one of the reforms that have been inaugurated or promoted by the JOURNAL. In its existence that is now approaching the half-century mark we have steadfastly stood for the things that make for the welfare of the mining industry. The fact that we have sometimes had to take the unpopular side of a public question has never deterred us from advocating what we have deemed to be the right, and we may be pardoned the egotism if we say that we have not often seen reason to change our views respecting broad questions of public affairs affecting the mining industry. In the questions of the day, such as a sane consideration of the problem of conservation of resources, the opposition to bureaucratic interference, the leading toward publicity of the reputable mining companies, the elimination of the deceptive promoters from the mining business, the introduction of means and legislation for the lessening of accidents in mining, the opposition to combinations in restraint of trade, etc., we shall pursue the same activity that has characterized us in the past.

At the same time we shall lead the way, as ever, in the publication of the purely technical contributions and discussions that mark the advance in the arts of mining and metallurgy. Of the advance during 44 years the file of the JOURNAL is a complete record. We lead where others follow. We are generally the first and are always the most exhaustive. We serve the entire mining industry, not merely a part of it, and not merely our own country but also foreign countries, our subscribers being numbered among most of the countries, civilized and uncivilized.

This catholicity sometimes invokes

criticism. One subscriber wrote complainingly that he was not interested in more than 40 per cent. of the paper. We took this as a compliment. If we could interest every reader in 40 per cent., or even 20 per cent., we should think ourselves about ready to pass to some higher sphere. The paper is of great size. Each issue contains one-half the type of the average scientific treatise, or the equivalent of 26 ordinary volumes per year—a library in itself—and there is a great variety of matter. A good restaurant presents a lengthy bill of fare, but no one expects to eat it all; nor does anyone need to go hungry. It is just the same with the reading that is offered by the JOURNAL. The man who is especially interested in zinc might like to see the paper devoted to the mining and smelting of that metal, but then the copper, coal, gold and iron people would have to starve. If any reader should take the trouble to reckon, as sometimes we do, he would find a pretty even distribution in the *menu* and plenty to read all around.

The chief function of a paper, whether popular or technical, is to tell the news. In matters of technical progress our contributors are naturally the mainstay. The pages of the paper are the forum wherein the telling of new methods and discussion of the same obtain the widest hearing, and progress in the arts is thereby advanced. When contributors upon any important subject are not forthcoming we spare no efforts to lead them on or send members of our own staff to see and report. Our regular correspondents in all of the important mining centers of North America and in many foreign countries are always alert to communicate new developments of all kinds. These are the things that go to make up a paper. It is the work of many hands —a coöperative institution. The editor simply directs and coördinates.

The JOURNAL appears this week in a complete new dress. The new headings improve the appearance of the paper, we think, and the new type makes the text easier to read. By new arrangements in our printery it has become possible to restore the editorial pages, together with the table of contents, to the front of the paper, where they used to be. Many of our readers have requested this alteration in "make-up," and we ourselves have desired it, but heretofore it has been impossible.

Boston & Alta Copper Company

A new promotion of the last week is the Boston & Alta Copper Company, capitalized in 300,000 shares, of which 132,500 are issued and 167,500 remain in the treasury. Of the treasury stock 25,000 shares are offered at $8 per share by Dick Brothers & Co., a Stock Exchange house. The prospectus is accompanied by reports from George T. Wickes and Pearse, Kingston & Browne. The former was professionally connected with the mine from 1882 to 1896. Pearse, Kingston & Browne are a reputable firm of engineers.

We infer, although it is not so stated in any of the documents, that the property in question is the old Alta-Montana mine, which subsequently passed into the hands of the Helena Mining and Reduction Company and was shut down in 1893, upon the great decline in silver, since when it has been worked only by tributers. In its day this was a famous mine, but it was exploited chiefly for silver and lead and it is now somewhat of a surprise to find it figuring as a copper mine.

It is quite clear from the engineering reports that the old workings are mostly inaccessible and that the amount and character of the ore remaining in them, not to speak of the condition of the workings themselves, are chiefly matters of surmise. Pearse, Kingston & Browne say that the records of 1¼ to 1½ million tons of ore extracted previous to 1893 show that the average value of the ore was in the neighborhood of $22 per ton—a vague statement—but they consider it probable that the run of the mine was less than that. "The mine assay records during the last year's work of the company showed 1.75 per cent. copper, 4 per cent. lead, 9 oz. silver and $1.40 gold."

It would appear that ore of this character might present some difficulties in treatment; if our recollection be correct the treatment question was more or less of a problem in the former history of the mine. Reference to our files shows that in 1883 there was considerable trouble among the stockholders of the Alta-Montana company over the incapacity of the management in erecting a plant that could "not handle the low-grade and refractory through cheaply mined ores." The Alta-Montana does not appear to have been a dividend payer. Later in the same year its property passed to the Helena Mining and Reduction Company, which gave one share for 10 of the old, and assumed a bonded indebtedness of $600,000. The Helena company is on record as having paid $197,970 in dividends, the last—$39,780 —having been in July, 1886.

We are glad to see the reopening of the famous old mines, some of which give now some promise, as Eureka, Pioche and Tombstone, but we do not recall any of them that has yet developed into a remarkably profitable undertaking, and almost all of them have presented considerable engineering difficulties. We do not mean to say that this will necessarily be the case at the Alta, but considering the poverty of the data at their hands it seems to us that Pearse, Kingston & Browne were not justified in regarding it as "not so much as a mining venture as a manufacturing proposition on a large scale," or in saying "the mining risks are practically nil." We should like to become conversant with some new mining enterprise whereof the risks are practically nil. The Boston & Alta impresses us as being very much of a prospect and it is upon that basis that it should be presented to the public, not as the going, or almost going, concern that the advertising has implied.

Suggestions Regarding Mining Investments

We scarcely need to commend to our own readers the remarks by Mr. Hammond upon this subject. We wish, however, that they might be brought more widely to the notice of the general public, who are naturally less informed as to the principles of mining investments than are our own circle of readers, and consequently we commend them to the fullest measure of attention by the daily press.

He has explained the pitfalls and attractions of mining investments, and has emphasized the difference between the mine and the prospect, in a remarkably lucid way, and in language that ought to be intelligible to the most innocent of the laymen. If all of the genus of suckers and gobies would select one of his gems of advice, have it engraved on a charm for their watch chain and read it once a day they would less often be the victims of a bunco or confidence game.

Ludwig Mond

By Charles Baskerville*

Ludwig Mond, the distinguished chemist, inventor, technologist and art connoisseur, died on Dec. 10 at his London residence, "The Poplars," 20 Avenue-road, Regent's Park, N. W. Doctor Mond was born at Cassel, Germany, March 7, 1839; and was educated at the Polytechnic School, Cassel, and at the Universities of Marburg and Heidelberg. In 1862, he went to England and engaged in the Leblanc soda industry, introducing his process for recovering sulphur from alkali waste. In 1873, he established, in partnership with T. T. Brunner, at Winnington, Northwich, Cheshire, the manufacture of ammonia-soda by the Solvay process, which he perfected; and the works there constitute the largest alkali establishment in the world. Among the inventions of Mond were processes for the manufacture of chlorine, a method of producing gas for heating and power purposes, and a process of making pure nickel. The latter was based on the formation of nickel carbonyl, a chemical compound which he discovered and investigated with Langer and Quincke. A list of his patents is found below.

Application of Research the Cause of His Success

At the inaugural meeting of the Society of Chemical Industry held in London in 1881, Mond read a paper on "Patent Laws as applied to Chemical Inventions," in which he remarked that, "Science tells us how very far we are from attaining our industrial aims with anything approaching the theoretical expenditure of force. Science also tells us in what directions we may look forward to arriving at improvements. I might say that we are on the eve of creating a science of invention, that is, of developing scientific methods for solving industrial problems." In 1889, in his presidential address before the same organization, Mond—in order to exemplify the application of methodical research to an industrial problem—presented an account of the work he had been engaged in for many years in relation to the procuring of new and abundant supplies of ammonia. His attention was called to this subject as early as 1861, but it was not until 1879 that he found abundant opportunity to investigate thoroughly the various processes which had been proposed for obtaining ammonia from the nitrogen of the air. This work led to the construction of gas producers and absorbing plants of various designs, and Mond and his assistants achieved great success in economically obtaining ammonia, tarry matters and combustible gases from coal. Then, too, they proved the delusiveness of some supposedly valuable processes; and the results obtained showed Mond to be, to quote Sir Lowthian Bell, "A man of exceptional intelligence and learning supplemented by that devotion of mind which qualified him to pursue his work with great energy and perseverance."

Discovery of Nickel Carbonyl

In the fall of 1895, Mond visited the United States and on Nov. 11 delivered an address on "The History of My Process of Nickel Extraction" before the New York Section of the Society of Chemical Industry. This process, it appears, was discovered in an accidental manner;

Ludwig Mond

to quote, in part, his own account: "Soon after I had satisfied myself that the ammonia-soda process was far cheaper than the Leblanc process for producing carbonate of soda pure and simple, it became evident to me that a time would come when the Leblanc process would produce carbonate of soda as a by-product of the bleaching powder manufacture, which it would have to dispose of at any price it would fetch. I therefore undertook a series of experiments with the object of producing bleaching powder as a by-product of the ammonia-soda process." He gave his attention to producing the chlorine direct from the ammonium chloride, separated from the solution in which it is originally obtained by refrigeration; and in developing this process, he said: "I had to construct a plant for volatilizing NH_4Cl, which I found an extremely difficult problem, as the vapor of this substance not only acts on oxides and salts, but also violently attacks the large majority of metals. I succeeded in lining iron vessels with glazed tiles in such a way that they would withstand this action, but I required valves for changing from the current of ammonium chloride vapor to hot air and *vice versa*, which had to be very tight to prevent a large loss of ammonia. I found that nickel was one of the few substances suitable for the construction of these valves, and that it was not at all attacked by ammonium chloride vapor. On the laboratory scale these nickel valves worked perfectly, but when I applied them on a manufacturing scale I found them to be acted upon and very soon to become leaky. The faces became covered with a black crust, which, on examination, was found to contain carbon. The source of this carbon seemed mysterious, the only difference between the work on the small scale and that on the large scale being that on the small scale we swept the ammonia out of the apparatus by means of pure CO_2, before admitting the hot air; while on the large scale, we used the gases from a limekiln, containing a few per cent. of CO. This led us to study the action of CO on nickel." Assisted by Langer, Mond discovered the curious compound nickel carbonyl, and for a long time they were engaged in an investigation of its physical and chemical properties. Finally Mond came to the conclusion that it ought to be possible to make use of the ease with which nickel is converted into a volatile gas by CO—while practically all other metals, and notably cobalt, were not acted upon by this gas—for separating nickel from cobalt and other metals on a manufacturing scale; consequently he "erected a plant on a large scale near Birmingham, and after several years of hard work, during which the apparatus had to be several times reconstructed so as to fulfil all the conditions of this rather delicate process," he succeeded in his object.

Personal Traits and Incidents

Doctor Mond was an art lover, and his collection of early Italian masters is one of the finest in England. He was fond of Italy, and maintained a residence at 64 Via Sistina, Rome.

He founded and endowed the Davy-Faraday Research Laboratory of the Royal Institution in 1896. He was a fellow of the Royal Society; vice-president of the Royal Institution; a life member of the London Chemical Society, of which organization he served on the Council in 1885-6, and acted as vice-president in 1887-90, and 1894-98; an original member of the Society of Chemical Industry, of which he was president in 1888-89 and vice-president in 1890; a member of the British Association for the Advancement of Science, acting president of the Chemical Section in 1896; an honorary member of the Deutsche Chemische Gesellschaft since 1908; and a member of the Berliner Verein Deutscher Chemiker. He was also a fellow of the

*Professor of chemistry, College of the City of New York.

Institute of Chemistry, and the recipient of the honorary D. Sc. degree from Victoria and Oxford Universities, and an honorary Ph. D. from Heidelberg University. He was vice-president of the joint organizing committee of the Seventh International Congress of Applied Chemistry, which was held in London from May 27 till June 2, 1909; and acted as president of Section II, Inorganic Chemistry and Allied Industries. During the session of the Congress, Doctor Mond held several receptions at his home. At one of these, which was given by Dr. and Mrs. Ludwig Mond and Robert Mond, their son—also a chemical engineer of prominence—on Sunday afternoon, May 30, about 1700 tickets were issued. These included the entire Italian delegation, which took advantage of the occasion to present Doctor Mond with a noble bronze in appreciation of his numerous gifts to the art and science of Rome. The garden party was not only complete in the most elaborate detail for the varied entertainment on a suitable scale for the large company, but was arranged to display some of the exquisite ancient art recovered in Egyptian excavations, the expenses of which were borne by the Mond family. In the adjoining home of Robert Mond there was perhaps the best exhibition of colored photographs—many taken by him—in any private collection. One also saw there pure nickel and cobalt in various forms, and the various carbonyls of nickel, iron, cobalt and palladium, some shown for the first time.

Royalty Reductions by the Ontario Government

BY W. F. BOERICKE*

The Ontario government has at last yielded in part to the demands of the mine owners at Cobalt for a reduction of the royalty tax on the mines affected. The fight against the royalty has been carried on for some time, but this is the first real concession that has been made. It is of large significance not only to the half dozen mines which will benefit by the reduction, but to the entire camp as well, in insuring a more profitable basis on which the mines may be worked.

Under the old arrangement the so-called "royalty" mines, which include the Cobalt Townsite, City of Cobalt, Chambers-Ferland, Nancy Helen, Cobalt Station Grounds and one or two others of minor importance, paid a straight royalty of 25 per cent. to the government on the gross output of the mines; that is, the value of the ore at the shaft mouth. The government, however, paid its quota of the treatment charges on the ore received. Such an arrangement could yield a profit, under ordinary conditions, only to mines that had extraordinarily rich ore or very low working costs. In many cases it meant a prohibitive figure, practically, for the management, or at best a production leaving very small, if any, margin of profit for capital account.

Under the new arrangement, the same royalty (25 per cent.) is imposed, but is collected on the net profits at the end of the year. There is a further provision that if the profits do not exceed $10,000 no royalty will be imposed, this sum being set aside for capital account.

A typical case will make the situation clear, and show how much the mines will benefit. Suppose a mine is capable of turning out 1,000,000 oz. of silver per year, having a value, say, of $500,000. Formerly the government took 25 per cent. of this, or $125,000, but under the new régime all mining costs and treatment costs are first deducted. These may be taken as 10c. per oz. for mining and 10c. for treatment, and the total cost would then be $200,000. Deducting this from the value of the ore leaves $300,000. The government gets 25 per cent. royalty from this amount, which is $75,000 or about 15 per cent. of the gross value of the ore.

There is another point to be remembered. Suppose a reduction works or concentrator were to be erected. Formerly the company would have to pay the cost, after first paying the royalty. Now this cost may be entered under operating costs and improvements and taken out of gross profits. The government will get its royalty on the net proceeds after charging off such expense. For a company operating on a narrow margin of profit this would frequently mean whether the mine were to be a success or a failure. The owners of the mines affected claim to be entirely satisfied with the reduction, and state that their properties will be operated immediately to their full capacity.

*Mining engineer, Cobalt, Ont.

California Oil Dividends for December

Below are tabulated the dividends declared payable in December by California oil companies, as reported in the *San Francisco Chronicle*, Dec. 13, 1909. The initial number in each case is the number of the dividend:

	Company.	Div.	Total.
6	American Petroleum...	$1.00	$119 286
44	Brookshire	0.01	5,000
56	Caribou	0.25	20,175
34	Euclid	0.01	3,500
34	Illinois Crude.....	0.01	2,000
..	Mexican Petroleum....	0.01¼	84,740
2	Paraffin	0.01	3,000
7	Palmer	0.01	18,020
13	Royalty	0.02	400
6	Record	0.07½	7 500
15	Rice Ranch.....	0.01	3,000
2	Silver Tip.....	0.10	7,500
22	Sterling	0.25	62 000
20	S. F. & McKittrick....	0.30	15,000
161	Union	0.50	124,813
100	Western Petroleum....	0.50	40,000
..	Western Union.....	2.00	20,000

December Dividends

In the accompanying table are shown the amount per share and total amount of the dividends paid during December, 1909, by a number of mining and industrial companies in the United States, Canada, South and Central America.

U. S. Mining Companies.	Situation.	Amt. per Share.	Total Amt. Paid.
Acacia, g.....	Colo.	0.01	14,500
Bunker Hill & Sullivan, sl.....	Idaho	0.15	45,000
Butte Coalition, c...	Mont.	0.25	250,000
Calumet & Arizona,c.	Ariz.	1.00	200,000
Calumet & Hecla, c..	Mich.	8.00	800,000
Colorado, l.g.s.....	Utah	0.08	80,000
Colorado Gold Dredging.....	Colo.	0.25	25,000
Doctor Jack Pot....	Colo.	0.00½	15,000
Elkton Con., M. & M., g.....	Colo.	0.02	50,000
El Paso, g.....	Colo.	0.01	24,500
Federal, M. & S., pf..	Ida.	1.75	210,000
Grand Central, g....	Utah	0.04	10,000
Iron Blossom, s.l....	Utah	0.08	80,000
Jerry Johnson, g....	Colo.	0.01	25,000
Mary McKinney, g..	Colo.	0.01	13.042
North Star, g.....	Cal.	1.20	300,000
Nev. Con., c.....	Nev.	0.37½	431,700
North Butte, c.....	Mont.	1.00	400,000
Old Dominion, c....	Ariz.	0.50	146,623
Old Dominion M. & Sm.....	Ariz.	1.00	162,000
Oroville Dredging, g.	Cal.	0.12½	87,500
Phelps, Dodge & Co.	U. S.	0.04½	2,022,057
Quincy Mining Co., c.	Mich.	1.00	110,000
Round Mt., g.....	Nev.	0.04	32,000
Sioux Con., s.l.g....	Utah	0.03	22,391
Snow Storm, s.l.....	Ida.	0.01½	22,500
Tennessee, c.....	Tenn.	1.25	250,000
Uncle Sam Con.,g.s.l.	Utah	0.02	10,000
United Gold Mines,g.	Colo.	0.01	40,000
Utah Copper, c.....	Utah	0.50	366,812
Victoria, l.s.g.....	Utah	0.02	5,000
Yukon Gold.....	{U.S., Can.	0.10	350,000

U. S. Industrials.	Situation.	Amt. per Share.	Total Amt. Paid.
Am. Smelters, pf., A.	U. S.	1.50	255,000
Am. Smelters, pf., B.	U. S	1.25	375,000
Gen. Chemical, com.	U. S.	1.00	74,103
National Lead, pf...	N. Y.	1.75	260,820
Standard Oil.....	U. S.	10.00	9,700,000
U. S. Steel, com....	U. S.	1.00	5,083,025

Foreign Mining Companies.	Situation.	Amt. per Share.	Total Amt. Paid.
Crown Reserve, s...	Ont.	0.10	175,000
El Rayo, g.s.....	Mex.	0.06	21,601
Granby Con., c.....	B. C.	2.00	270,000
Kerr Lake, s.....	Ont.	0.35	210,000
Rio Plata, s.....	Mex.	0.07½	28,007
Lucky Tiger, com., g.	Mex.	0.05	35,750
Santa Gert. y Guadelupe, g.s.....	Mex.	1.00	60,000
Trethewey, s.....	Ont.	0.15	15.009

The Himalaya chrysoprase mines near Porterville, Tulare county, Cal., are shipping considerable quantities of the crude stone to Germany. The material is more or less flawed and good pieces for cutting are scarce but the color is excellent. Many fine stones have been found from time to time. The deposit has been worked almost continuously since its discovery in 1889. The chrysoprase occurs in some abundance and associated with it are a number of other forms and varieties of quartz minerals capable of being used in the arts for ornamental purposes. Owing to the present fad for green stones there is a lively demand for chrysoprase from California.

DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

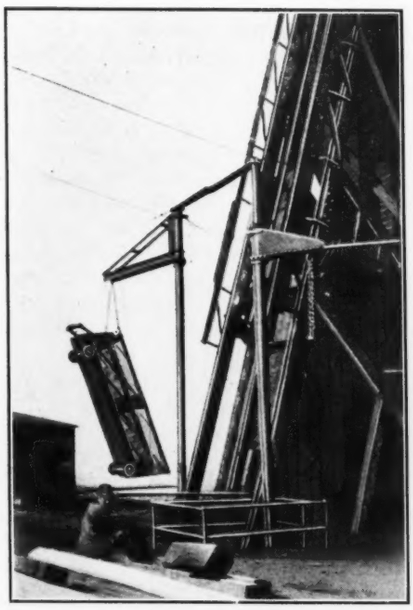
Crane for Changing Skips

At mines hoisting in skips it is advisable, and sometimes necessary, to have a specially constructed cage for lowering and hoisting men. The accompanying illustrations show the top arrangement for changing man and ore skips at the Burra Burra mine of the Tennessee Copper Company, Ducktown, Tenn. At this mine cages are interchanged and made ready for lowering in from 30 to 60 sec. A similar arrangement was successfully used for a number of years at the famous Gwin mine on the Mother Lode of California.

As shown, there are two cranes at the shaft mouth, one to handle each skip. The cranes are made up of iron-pipe verticals with channel-iron swinging arms stayed from the top of the uprights. The swinging arms carry small traveling crawls to which are attached the chains by which the skips are lifted. The cranes are connected across the top and are also stayed in several directions with wire cables. The chains can be attached to the skips by slipping the hooks at their ends into eyes which are provided on both the man and ore skips.

The operation of changing the skips is as follows: When a skip is raised to the surface the chains are attached to it, the cable secured (as will later be explained), the thimble removed and the skip then swung out of the way by a rope attached to the arm of the crane; the other skip is then swung in from the other crane, the cable attached to it, chains knocked loose, cable made free, and it is ready to lower.

A small winch, not shown in the illustration, is provided on the headframe above the shaft's mouth. When skips are to be changed, a couple of men must stand ready at this winch in order to fasten the cable so that there will be no danger of its being pulled over the sheaves. A hitch is thrown about the cable with a piece of rope secured to and drawn taut by the winch. As stated, the whole operation of changing skips occupies only about a minute, and from the added security obtained in raising and lowering employees, the small investment of installation is certainly warranted.



MAN-SKIP SWUNG FROM SHAFT

SKIP-CHANGING ARRANGEMENT AT BURRA BURRA MINE, SHOWING MAN-SKIP IN SHAFT AND ORE-SKIP SWUNG OUT

Hand Sorting of Ore

At a number of the milling plants in southeast Missouri a certain amount of hand picking of the ore is done. The scheme is as follows: The ore is hoisted from the mine in skips and emptied directly upon a metal link-belt conveyer, approximately 30 ft. long. The belt travels 25 to 40 ft. per min. Two men are usually employed at the picking belt. The amount of waste rock varies considerably. In one case about two 50-ton cars of waste material are picked out per week, at a shaft where the output is 5 to 7 cars per day. In this way at least 7 per cent. of the mine output is disposed of at a cost of 20 to 30c. per ton, which is cheaper than passing the barren rock through the mill.

The picking floor is usually placed directly over the railroad track and when cars are obtainable the waste rock is tossed into the car. Otherwise it is placed on the floor, which will hold at least a carload, and is shipped out when cars are at the disposal of the mining company. From the picking belt the ore passes over 3-in grizzlies. That which passes through goes to a storage bin, while the coarse rock goes through a crusher and thence to the same bin. From here it is delivered to the mill by railroad cars.

New Tipple and Hoist Installation

The accompanying photograph is a view of the new steel tipple frame erected by the Woodward Iron Company at its No. 3 slope on Red mountain, Alabama. The Republic company was first to erect a steel tipple frame on the mountain, but that company hoists in 10-ton skips after the practice of the Tennessee company, while the Woodward Iron Company will hoist in 5-car trains of 2-ton cars, dumping the entire train in a revolving tipple, which is shown plainly in the illustration. The bins are constructed of concrete reinforced with steel rails and discharge from either side toward the center. At this slope the Woodward company is installing an electric hoist which will be the first electric hoist equipment operated on Red mountain. The current will be generated at the company's furnaces from waste steam. In the picture the engine house is shown through the trees to the right of the tipple. The wooden incline shown in front of the new tipple is now used to shoot ore down from the slope entry to the narrow-gage railroad which conveys it to the No. 1 tipple and crusher around the hill.

NEW STEEL TIPPLE OF WOODWARD IRON COMPANY

Disposal of Power-plant Ashes

The disposal of ashes from a large power plant is an item of expense that often amounts to hundreds of dollars per year. Any device that will reduce this expense adds just that much to the dividends of the corporation.

The power plant of the Federal Lead Company, Flat River, Mo., comprises six 450-h.p. Heine boilers, five of which are in use all the time. Automatic stokers are used and 100 to 110 tons of coal consumed daily. The cinders and ashes drop into a pit below the level of the firing floor. All the pits are connected with a tunnel into which the ashes were formerly scraped and wheeled out in barrows to the ash heap. Later a cable car was installed but this did not work satisfactorily as the car would jump the track, or go over the end of the track, due to overwinding.

The scheme now in use consists of an inclined 8-in. iron trough set in the concrete floor of the tunnel, so the ashes may be scraped into it direct from the ash pit. As the ashes are dropped into this trough, water is turned in at the upper end, washing the ashes to the boot of a bucket elevator. The elevator has a 14-in. rubber belt, with a 12-in. bucket. The ashes are elevated vertically about 50 ft. where they are emptied into a trough and sluiced out with water. The trough is a 12-in. water pipe split in two, and is inclined about 1½ in. per foot. This installation saves the labor of four men on each shift, or 12 men since three shifts are worked here. Thus a large saving is effected which will soon pay for the entire ash-disposal outfit.

At the Oronogo Circle mines, Oronogo, Mo., hoisting is carried on from a depth of 230 and 245 ft. At the 230-ft. level is a heavy door that is closed when the hoisting is from that level. This door forms a platform from which the buckets are hoisted. The door is 5x6 ft., hinged at one side and is made of 2-in. plank nailed to a strong frame. It may be opened by the cable which hoists the ore. When hoisting from the lowest level, the door is opened, and turned back far enough to be out of the way. At this mine when it is desired to close the door, the cable is attached to it, slowly wound up until the door reaches a vertical position, and then lowered to place.

New Ventilation System

In a number of the Cripple Creek mines, Colorado, some of which have been quite thoroughly opened, there is no production because of the foul air. To overcome this difficulty the Worcester system of ventilation has been placed in a few workings, and good results obtained. This method was lately installed at the Prince Albert tunnel. The superintendent, after giving it a fair trial, pronounced it an unqualified success. The method is simple and easily accomplished: Two bulkheads, including an air-tight entrance, are constructed. A pressure of two ounces per inch of compressed air has been found ample to ventilate thoroughly the 1400 ft. of tunnel workings and crosscuts thereupon. Prior to the equipment of the tunnel with the Worcester device work had been practically suspended in the heading and crosscuts.

The Conundrum mine on Gold hill is to be similarly equipped, but here the largest plant yet constructed will be necessary to properly confine the mine gases by air pressure. A fan, 7 ft. in diameter and driven by an electric motor, will be installed at the Conundrum incline in addition to the several bulkheads that will be built at stated points in the two miles of workings, this distance including the Moon-Anchor connections. The Chicken Hawk, on Guyot hill, and the Little Nell, on the Arequa townsite, south of Elkton, have been equipped with the Worcester system, and the deep workings of these mines are now well ventilated and free from mine gas.

Various means have been employed to expel noxious gases, and many mine workings were abandoned. The value of the system brought into use by Mr. Worcester, has been made apparent wherever it has been properly applied. There are many places in the district where it is needed. In many mines of other districts, there is little trouble from noxious gases largely because ventilation has been provided by underground connections with shafts, raises, etc., but it is well to know of the application of the Worcester system in cases of need.

A Safety Hoisting Device

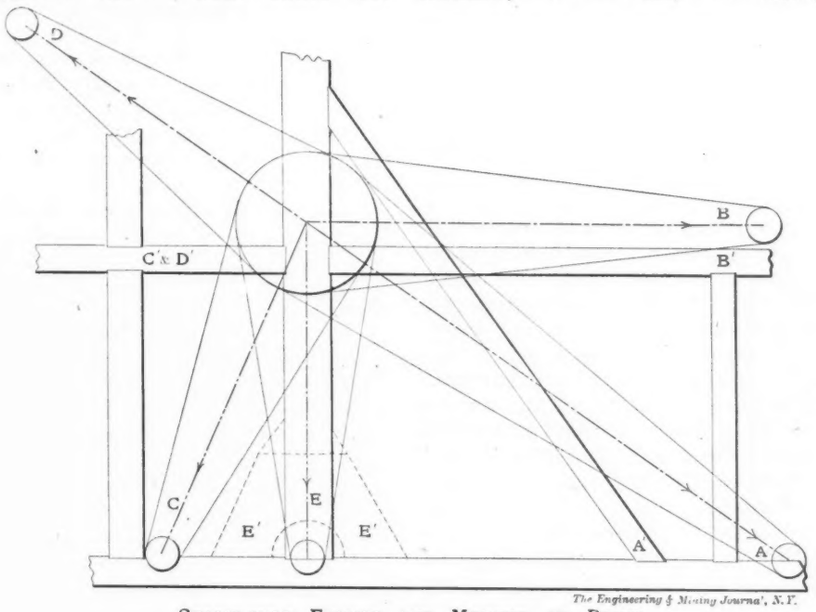
A safety device designed to prevent mine cages from being hoisted into the sheaves has recently been put in use at all of the principal mines of Butte district. The invention works automatically on the brakes of the hoisting engines so that when the engine is going at too high a rate of speed as the cage is approaching

the surface the steam is automatically admitted into cylinders which apply the brakes. The device begins to operate when the cage is within 100 ft. of the surface and has proved itself able to stop the cage within a distance of 80 ft. A recent test, made when a powerful hoisting engine was going at full speed, has thoroughly satisfied the mine managers of its capabilities. Several serious accidents have happened in Butte by reason of the engineer hoisting a cage into the sheaves and it was this fact that caused interest to be given to devices of such a nature.

Position of Driving Power for Stamp Mills

BY ALGERNON DEL MAR*

In the JOURNAL of Sept. 25 an article appeared under my name entitled "Battery Posts of Reinforced Concrete." This form of construction is the only one that will allow of a vertical pull on the cam shaft, therefore it needs no bracing and may be independent of the ore bin or other foundation. The illustration shows a composite picture of the different forms of construction. The A-frame is omitted. *A* is the direction of pull for an angle-brace construction and *A'* the brace; *B B'* shows the front knee; *C C'* the usual form of back knee; *D D'* the overhead form where the slack belt is uppermost, and *E E'* the concrete battery post. A 3-ft. semi-circular casting forms a hollow through the battery posts and mortar blocks in which the driving-shaft boxes are placed.



STAMP-MILL FRAMES AND METHOD OF DRIVE

Since the publication of the idea of concrete battery posts and cam-shaft cushions I have discussed the idea with many practical millwrights who without exception have declared it practical, and some were enthusiastic in its praise.

*Mining engineer, South Pasadena, Cal.

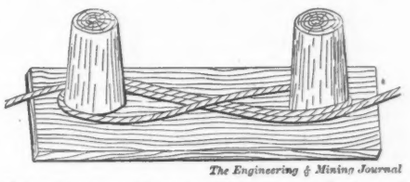
Taking Up Slack on an Alternating Current Cable

BY JAMES A. SEAGER*

I recently heard of a case where the cable which was to feed the motor of a sinking pump was wound round a drum at the top of a shaft in order to allow of a length being paid out as the pump had to be lowered. The result was that the cable on the drum got surprisingly hot in a few minutes, and it was only by a frenzied rush to the switchboard that the colliery electrician was able to save not a few yards of valuable cable.

It is therefore evident that for portable machinery such as drills, coal cutters, and similar plants driven by alternating-current motors, it is inadvisable to use a cylindrical drum for taking up the slack because the self-induction in the coil of cable on the drum may be considerable, and may not only cause the voltage at the motor to fall below the minimum working limit of the machine, but also lower the power factor of the supply. Moreover, should the drum be of iron, or should any metal masses be in the vicinity of the coil of wire, heavy eddy currents will be set up, heating the mass, and either drying or charring the insulation of the cable. Further, there is a practical difficulty to be encountered in putting the cable off the drum without kinking or straining it, unless the drum is mounted on an axle and provided with slip rings in order that it may revolve and yet keep contact on the electric circuit. A provision of slip rings, in addition to being expensive, involves the laying bare of live metal probably in an exposed position, and in an atmosphere where flying coal dust is abundant there is a great chance of dangerous sparking.

In order to meet the difficulty of lengthening or shortening a cable at will, the simple arrangement shown in the sketch overcomes all these difficulties and it has been found in underground working to be a useful appliance for coal-cutting and drilling, where the face advances a small distance every day and the cable has to be paid off a yard or two at a time. The device consists of a stout, flat board upon which are mounted two tapering uprights, circular in shape and securely fastened to the board by means of coach screws or bolts. The size of the uprights depends upon the diameter or stiffness of the cable so that it puts no undue strain at the bend. In order to deal with a cable 1 in. in diameter the centers of the uprights should be about 3 ft. apart and their diameters on the smallest portion should be not less than 9 in. In laying cables on the block they should be allowed to take an easy and natural bend without being pulled too tight.



DEVICE FOR TAKING UP SLACK CABLE

The base is made of two or more 2½- or 3-in. planks, each about 9 in. wide with coach-screw heads countersunk. In the case of a three-phase machine supplied by three separate single-core cables, three of these holders, fixed horizontally one above the other against the wall, are very convenient, and when paying off the cable it is necessary only to draw off the front coil at each peg and allow it to untwist itself. The arrangement is also convenient in connection with portable pumps. Where the pumps are small and the cables are light, the slack-taking arrangement can be fixed to the pump frame so that it is unnecessary to make any electrical disconnection when moving the pump forward.

Swelling ground cannot be held by timber; means must be provided for relieving the pressure of the ground from time to time. It will cause little trouble if spaces are left between the lagging through which the pressure may be eased at intervals by removing some of the rock material. Expedients such as packing with straw are valuable only until the swelling becomes sufficient to pack tightly the cushioning substance. When this becomes packed solidly it transmits the pressure to the timbers.

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Suggestions Regarding Mining Investments

Difference between a Prospect and a Mine. Need of Engineers' Reports; Returns on Investment; Amortization; Some Don'ts for Investors

BY JOHN HAYS HAMMOND*

In a discussion of mining investments it is all important at the outset to distinguish clearly between the two general classes of mining properties, prospects and mines.

By the term prospect, the miner designates orebodies only partially explored or developed. Obviously investments in this class of mining are always of a speculative character, and for this reason are often referred to as mining gambles. The capital required to purchase and develop a prospect is, of course, much less than that required for the purchase of a developed mine and the installation of the mining and reduction plant necessary for its exploration. While financial loss in each particular case of failure in investments of this character is smaller, the losses are, nevertheless, more frequent because of the inherent risks involved compared with those of developed mines. In the event, however, of a fortunate selection of a good prospect, the result of subsequent development work may transform that prospect into a paying mine, and then the ratio of profits realized to capital invested becomes far greater than in the case of properties already developed. In other words, one may, if he be of a sanguine disposition, not unreasonably hope for—mind you, I do not say expect—a return of profits amounting to many times his investment in ventures of this kind. While, on the other hand, the most optimistic investor would not be justified in entertaining hopes, far less expectations, of such large profits from his more conservative investment in developed mining properties.

Development of Prospects a Field for Large Interests

A peculiar, indeed, unique, kind of mining talent is essential in "sizing up" a mining prospect to determine whether or not the investor is warranted in risking his money chiefly on the strength of surface indications of the orebodies, in default of more extensive and reliable developments. There are, as I have intimated, few engineers who possess what is called a "good nose" for a mine in connection with the experting of undeveloped, or partially developed, mining prospects. Nevertheless, it is from just such beginnings and by just such financial risks that the great mines of the world have been developed. And fortunate indeed is he who has had the ability or luck (for luck is admittedly an element in the issue) to invest his money in what ultimately proves to be a successful venture of this kind. Probably not more than one in six of what would reasonably be regarded by experts as prospects deserving exploration, proves ultimately to be a winner. That is to say, such risks may be regarded as a six to one shot! And yet it is my opinion, based on considerable experience in this class of mining, that no field of mining investment is more attractive, and at the same time, I venture to say, more safe than investments in prospects if carried out by men with good judgment and with the requisite experience. But this kind of mining should be confined to such capitalists or exploration companies as can afford to incur the risk of several failures before attaining final compensating success. Preferably such operations should be undertaken by those who have had mining experience, and, therefore, who have a proper appreciation of the degree and extent of the financial hazards involved.

At the risk of the imputation of "damnable iteration," I wish to emphasize the relative degree of hazard in investments of this character, and to urge the public to exercise due discrimination in the investment of money in the classes of mines referred to. Unscrupulous promoters and other financial sharks take advantage of the ignorance of the credulous invester to sell stock in a company, the assests of which are the undemonstrated potentialities of a prospect and not the reasonably assured income of a developed mine. *Caveat emptor!* Indeed, the great majority of alluring prospectuses issued to the gullible public, when analyzed by a mining engineer, show that the properties purporting to be mines are in reality only prospects of a highly speculative value.

Many Reduction Plants Installed before Warranted

A very common cause of the loss of money in mining is due to the precipitate action of companies in installing reduction plants upon the properties before the mines have been sufficiently developed to supply ore. Throughout all the mining districts of the world there are countless monuments to the folly of such investors in the ghastly shape of abandoned mills.

Those experienced in the investment in prospects almost invariably insist upon what is called a working bond, to enable them to determine the value of the prospect by actual developments before the payment for the property. Sometimes, for this privilege, they are willing to pay a reasonable sum to be applied to the purchase price of the property in case their option should be exercised, or as a forfeit if the results of the developments are adverse and they decide to "turn it down."

Differentiating between Prospects and Mines

It is often difficult, indeed at times impossible, to define at what point in its stage of development a prospect ends and a mine begins. But in general terms it may be stated that where a property is sufficiently developed to enable the engineer to make a calculation of the net value of the ore reserves, and in addition to this to form an opinion as to the continuation of the orebody in depth beyond the limits of the ore in sight, with such a degree of probability as to assure the return of the capital invested in the erection of the necessary mining and reduction plants, such a property may then be dignified by the appellation of mine.

It is not always the amount of development work upon a property that determines to which category it belongs. Indeed, a few classes of ore deposits, owing to their peculiar geological features, possess such reliability in respect to the persistency of the orebodies as to warrant the investor in regarding them as mines and not mere prospects, in spite of the relatively small amount of exploratory work actually performed.

The well known ore deposits of the Witwatersrand in the Transvaal are a case in point. The geological formation there is *sui generis* in the history of gold mining. By a deep level, as understood in the Transvaal, is described a property which lies in the direction of the dip of the vein away from the mining claim containing the outcrop of the vein. The veins situated below the deep-level areas can be reached only by sinking vertical shafts hundreds, indeed thousands, of feet in depth. And yet, so reasonably assured is the expert of the continuation in depth of payable orebodies in this vein system, that some of us have had what would be regarded by engineers not familiar with local conditions as extreme temerity in our recommendation of the investment of hundreds of thousands of dollars in the sinking of vertical shafts to strike the veins at

NOTE—Address delivered before the Finance Forum of New York, Dec. 22, 1909.

*Consulting mining engineer, 71 Broadway, New York.

depths of from 2000 to 4000 ft. before even a speck of gold was visible. And to further emphasize our confidence in the success of such operations, many of us have actually started the erection of mills involving an outlay of capital of hundreds of thousands, indeed, upward of a million dollars in many instances, while the shafts were being sunk and before the veins had been cut.

Deep Level Mines of the Rand

If it will not be considered egotistical, I will briefly tell you, in this connection, the history of what are now known in the Transvaal as the deep-level mines of the Rand, and incidentally show you the manner of man that the late Cecil Rhodes, the great empire builder, was. His personality cannot fail to be of interest to those conversant with contemporaneous history. This will, I trust, justify the digression.

It was a starlight night—I recall the setting of the scene most vividly—on the plains of the country now bearing his name—Rhodesia. Mr. Rhodes, Doctor Jameson and I were on a wagon and horseback trip of several thousand miles, for the purpose of making an examination of what has since been proved to be the mines of King Solomon. In the course of our conversation and discussion of the great politico-economic question of the day, Mr. Rhodes asked my opinion as to the nature of the Transvaal gold mines. He was at that time the largest individual owner and the controlling spirit of the Consolidated Goldfields of South Africa, and I the consulting engineer of his companies. Much to his surprise, I told him that the mines of our company, though possessing merit, would not produce ultimately what he had been led to expect in the way of profits, having regard to the long time required for the realization of these profits. He then asked me what I thought of the probability of the veins extending in depth below the present deepest workings. I told him that it was my opinion, based on my knowledge of the geological conditions, that these veins would extend to a great depth. He then said, "Why not sell our shares in the outcrop companies and buy the deep areas which can be now purchased at a low price, since no one as yet regards them as valuable for other than agricultural purposes?" The outcrop companies he referred to were those I have previously described as prosecuting their mining operations from the surface down to a relatively small depth. I replied, "If the properties belonged to me I would do so." After a little further discussion on the subject he said, "We will do it." Thereupon we called one of our secretaries and dictated a cable to the London board of directors, instructing them to sell all the stock owned by the Consolidated Coldfields of South Africa in the outcrop companies. That very night we sent a trusted messenger on horseback 250 miles to the nearest telegraph station. About ten days afterward we received a cable from London to the effect that the London directors did not understand Mr. Rhodes' intentions, and asked whether it was his wish that the Consolidated Goldfields be liquidated. He thereupon immediately sent another cable to the effect that he was unable to explain more fully, but that they must follow out his recommendations without further question. Mr. Rhodes was inclined to be somewhat dictatorial—his certainly was a dominating though not domineering spirit. About a fortnight later we received a cable stating that the board of directors, though protesting, had begun to sell out the company's holdings. By the time we arrived at Johannesburg, a few weeks later, our company had many millions of dollars in cash to its credit. Without taking anyone else in the secret, I made plans to acquire thousands of acres of this undeveloped deep level area, situated below the most promising portion of the developed outcrop companies.

It required several months of patient and careful negotiations to acquire all this property, but finally we had it in our possession, and before I had left the Transvaal a few years later, many of these deep-level companies had been floated, shafts had been sunk, the veins had been cut, large mills erected, and dividends earned. With other deep-level mines since developed they are now yielding as much as $75,000,000 in gold per year. Indeed, upon the exploitation of the deep-level properties of the Rand depends its length of life, for the outcrop companies are becoming rapidly exhausted. Mr. Rhodes was much criticized at the time by the directors and others largely interested for having sacrificed, as they alleged, the interests of the shareholders of the Consolidated Goldfields company in thus disposing of these mining interests. But subsequent developments justified Mr. Rhodes' policy, for his company made millions of dollars in this transaction through the liquidation of its holdings in the outcrop companies, and within two years, by legitimate flotation of properties of undoubted intrinsic value, it was able to pay $10,000,000 annual dividends.

Engineer's Reports

In their reports, mining engineers and experts divide the ore of the mine into three classes. First, "ore blocked out." Second, "probable ore." Third, "possible ore." The ore blocked out can be very accurately determined by a competent expert through a careful and exhaustive system of sampling. In his estimates of probable ore, the engineer is confronted with different conditions, because here certainty stops and conjecture begins. I shall not weary you with the geology and other factors the engineer takes into his calculations in arriving at his estimate of probable ore. To a great extent this is a matter of the personal equation of the engineer. Some are inclined to allow as probable ore, that which is embraced in a block of ground lying below the ore actually blocked-out to a depth of, it may be 25 ft., or it may be in rare cases upward of 100 ft. The estimates will depend largely on the opinion of the engineer as to the persistency of the payable orebodies.

Estimates of possible ore are highly speculative, and yet I would prefer to take the conjecture, or guess if you please, of some engineers (because of their exceptional expertness) as to how much importance is to be attached to the occurrence of the possible ore, than to accept from others less qualified in this particular kind of mining clairvoyance an estimate of the probable ore. As I have said, here comes in the ability of the trained engineer to see beyond the end of the pick, which was the limit of the ore reserves and the probable ore of the old practical miner who was the mining expert of the past generation. I can well recall at the outset of my career the prejudice that prevailed against the educated mining engineer. In those days there were a great number of fakers who passed as mining experts, and the more illiterate they were the more practical they were regarded, and therefore absolved from any suspicion of being educated and inferentially a bookish theorist.

I am reminded of an important mining suit that was being tried on the Comstock, which involved some expert testimony on mine surveying. One of the witnesses, whose veracity was on a par with his technical knowledge, was asked by the opposing counsel how many degrees there were in a circle. Up to that time he had been too much for the opposing lawyers, who knew nothing about such procedure, and had given most convincing testimony in favor of his side of the case. It was a lucky inspiration on the part of the opposing lawyer to ask this question. With a contemptous smile the witness looked around the courtroom, and with one eye on the jury replied "Why, of course, everybody knows it depends on the size of the circle." Needless to say, the plausible testimony he had previously given was discredited.

As it is very seldom that a mine can be purchased on the basis of the net value of its ore-reserves, i.e., for the net value in sight, it is of great importance for the engineer to determine to what extent he can include "probable ore" in his determination of the net value of the mine. It is indeed upon the degree of risk assumed in his estimate of "probable ore" that the engineer has to decide whether or not he is justified in recommending the purchase of the property. "Possible ore"

is, of course, not to be taken into the engineer's calculations. It may be, however, in many cases that the possible ore, i.e., the potentialities of the mine, is the extra inducement that determines his favorable report.

Returns on Mining Investments

Mining investments differ in one very important particular from those of nearly every other kind; that is, the comparatively short life—the instability of the investment. It is, indeed, because of this feature that the rate of dividends in mining should be higher than in other investments rather than because of the relative degree of risk involved. While it may be stated, broadly speaking, that whatever risks there may be in mining as to the uncertainty of the extent and persistency of the payable orebodies in depth, the risks are, nevertheless, not greater in the majority of mining operations than those that appertain to many other kinds of commercial investments where indeterminate factors likewise obtain. Especially is this true where commercial investments are liable to be affected by variable conditions. There are, on the other hand, many distinctly advantageous economic features in the exploitation of mining properties that one does not find in other classes of investments, and this is especially true as regards gold mining. The rate of interest that one should usually expect in mining investments depends primarily upon the safety of the investment and upon its life or stability. In many mines persistency of the ore deposits and, therefore, the reliability of the mines as dividend payers, justifies the investment upon a basis in some instances as low as 8 per cent. dividends, to which, of course, must be added a certain percentage to provide for the amortization of the capital. Generally speaking, however, investments in mining securities are not to be regarded as attractive unless they return from 10 to 15 per cent. in dividends, in addition to the profits to be set aside for amortization. I wish to strongly impress upon investors the wisdom of clearly realizing the fact that mines have a short life compared with that of other investments, and for this reason to urge the investor to set aside a part of the profits, figuratively speaking, at least, as a sinking fund to provide for the return of the original investment before the mine is worked out. That is to say, "to realize that one cannot have his cake and eat it, too." What remains to be applied to dividends after providing such a sinking fund is the real touchstone by which the attractiveness of the investment must be determined. It must also be borne in mind that the cost of the plant must likewise be amortized, because mining and milling plants, after the mine has been worked out, have usually very little market value.

Advice to the Investor

Now, I wish to give you a few words of admonition under the caption "Don'ts:"

(1) Don't invest your money in a mining property simply because of the fact that a friend of yours (even if he be a blood relation) became rich through a fortunate investment made in mining stocks.

(2) Don't, on the other hand, be deterred from investing in a mining property because another less fortunate friend became bankrupt through some other mining investment.

(3) Don't allow any insinuating, slick, dishonest—not to apply the short and uglier word—promoter, or so-called stock broker, to overcome your natural modesty and convince you that because you have been successful in your own line of business you yourself are competent to determine the value of a mine. Many men of business ability in their own lines have made trips of self-deception to see for themselves that which existed only in their imagination. "Shoemaker, stick to your last!"

(4) Don't be influenced in your desire to purchase mining stock by the rich specimens that the mines have produced, even though you yourself have seen such specimens in the mine. Specimen rock of this kind is no criterion of the average grade of the ore upon which the success of the mine depends. I remember the story of old John Gashweiler, a well known mining capitalist of his day, when he was asked his opinion on the value of a property from which very rich specimens of ore were shown him. "You might as well show me the hair from the tail of a horse," said Gashweiler, "and then ask me how fast the horse can trot."

(5) Don't buy stock in a mine because it has produced a profit of millions of dollars in the past, for the mine is obviously so much poorer for the millions already abstracted.

(6) Don't buy stock in a mine solely because it is in a far off country, even though "distance lends enchantment to the view."

(7) Don't buy stock in a mining company simply because of the fact that it adjoins another mine of great value. That may be interesting, but it is not conclusive as to the value of the mine in question.

(8) Above all, don't buy shares in a mine unless you have the unqualifiedly favorable report made by a mining expert of integrity, ability and experience, and one who has made a success in investment of money for his clients. An engineer may have the best obtainable technical training, supplemented by considerable practical experience and yet lack certain qualifications in his professional make-up that determine success or failure.

(9) Don't buy stock in a mine unless you are sure that the board of directors is honest and competent, because good management is just as essential to success in mining as it is in other enterprises. In the early days of mining in the Transvaal, the ignorance of the boards of directors of mining companies was indeed lamentable, though sometimes comical. A well authenticated story is told of a certain board of directors in London, to whom the manager had cabled telling them the necessity of having another mining shaft upon the property, as the old one was out of repair and dangerous. They cabled in reply to the manager to endeavor to find a second-hand one.

(10) In short, don't abandon all your good common sense just because the investment happens to be one in mining and not in some other class of industrial securities.

Now all these admonitions you have undoubtedly heard before, and you might be inclined to criticize me as the young Englishman did at the play "Hamlet," because "he heard so many old quotations in it." I trust you will not regard these admonitions as tantamount to advice on my part to keep out of mining, for such is not my intent. In common with all mining engineers who are interested in the legitimate development of the great mining industry, I am zealous in my efforts to eliminate, or at least to minimize, that class of unscrupulous promoters and stock brokers who bring so much discredit upon the industry, and at the same time such lamentable disaster to their victims, the great majority of whom can ill afford to bear their losses.

Needed Legislation

I think there should be some drastic legislation in connection with the flotation of mining companies (indeed, many other industrial companies should be included in this), to compel them to publish, before flotation, reports of engineers; to state the price at which the properties were acquired by the vendors; the amount of the promoters' commission, etc. And also to compel the companies to issue full monthly and annual reports as to their financial status, as to the ore reserves, the conditions of the lowest developments in the mines, etc.

I think it would be well also to compel such companies before going to flotation to have on printed prospectuses a conspicuous skull and bones, such as is used as a mark of danger in the case of poisonous medicines. The warning would not be necessary to deter the investor from the purchase of the stock of the companies, but to call his attention to the fact that such an investment must be deliberately considered before taking, and then only on the advice of his financial doctor, the mining engineer.

While in these remarks I have held out

to you the red flag of danger, nevertheless when the track is clear and in good condition I have great faith in the safety of mining investments. Indeed, speaking with a proper appreciation of the importance of the statement, I have no hesitancy in expressing the opinion that, conducted upon the right basis when extended over many operations, there is no business with which I am familiar, that offers such attractive and at the same time such safe investments as the mining industry.

You have all, probably, heard Mark Twain's definition of a mine as "a hole in the ground owned by a liar," but a fairer definition, I believe, is "a hole in the ground sold by a lying promoter to a stupid investor."

TRIBUTE TO THE PROSPECTOR

From my experience with the miner himself (and I claim to be able to speak authoritatively on this subject, having spent many years in close association and on the most intimate terms with the miners of several continents), I know him to be a man of exceptional probity, and it is but tardy justice to recognize this virtue. The miner, it is true, is hopeful and sometimes confessedly too sanguine, but these very qualities are indispensable to his vocation. This tribute applies particularly to the courageous, indefatigable prospector. I have met him on the ever frozen tundras of Siberia and in the impenetrable jungles of the deadly tropics. I have met him on the high peaks of the Andes and on the desert sands of Death valley. Wherever I have met him I have found him a man of hope, of courage, of generous impulse.

The prospector is above all others the real pioneer of civilization, antedating the missionary and the railroad surveyor, and his discoveries it is that have given the life blood to modern industry. Fnally, if you have not been successful, blame not the honest miner or the industry because of the fact that you have not used good business sense and discrimination in your mining investments.

Changes at Ducktown

W. H. Freeland, general manager of the Ducktown Sulphur, Copper and Iron Company, Ltd., of Isabella, Tenn., has announced that his resignation, made a year ago, takes effect on Jan. 1, and that he will retire from active work. Prior to his appointment as general manager of this company in 1898, Mr. Freeland was assistant manager of the Mountain Copper Company, of California. At Ducktown, in 1902, he developed and woked out to its first practical success, the pyritic smelting process which has ever since been the practice of the Ducktown company, and, since its adoption in 1904 by the Tennessee Copper Company, the exclusive smelting practice of the Ducktown district.

Mr. Freeland also invented and installed the Freeland mechanical charger which for the last five years has replaced 16 men per furnace in transporting the furnace charge from the bunkers, and charging the 400-ton stacks of the Ducktown company with great precision.

During Mr. Freeland's management this company has more than doubled its business, has rebuilt almost its entire plant, and in 1909 commenced the manufacture of sulphuric acid on a large scale.

Charles W. Renwick, assistant manager, and William F. Lamoreaux, construction engineer, have been appointed general manager and assistant manager, respectively, their appointments taking effect Jan. 1. Mr. Renwick has been with the company as assistant manager since 1899, when he came from the Mountain Copper Company, of California. Mr. Lamoreaux has been connected with the company since 1905, and is a graduate of the Michigan College of Mines.

Goldfield Consolidated

The monthly report of the general manager of the Goldfield Consolidated Mines Company, gives the production of that company during November, 1909, as 19,285 tons containing $724,451, or an average of $37.57 per ton, of which the whole was milled with an average extraction of $35.30 per ton, or 93.96 per cent. The total net profit was $499,767, or $25.92 per ton.

Development Work—On company account, 4354 ft. of development work were performed and 147 ft. by lessees.

Operating Costs—The total cost of mining, development, transportation, milling, office and general expense was $6.922 per ton, distributed as follows:

OPERATING COSTS IN NOVEMBER, 1909.

Stoping (including a portion of general expense)	$2.55
Transportation	0.115
Milling	1.907
Total cost of production	$4.572
Development (including a portion of general expenses)	2.35
Total cost of operation	$6.922

Costs are higher than normal on account of the large amount of development work performed. The footage driven is 611 ft. in excess of that during the previous month.

Combination Mine—The Hampton stope is now thoroughly accessible from all levels, and a good production of ore is being made. All effects of the cave have been corrected, and an extension of the orebody developed 70 ft. further south on the 280-ft. level. A stope has been started on the same orebody from the 350-ft. intermediate level. In the central portion of the mine a new stope on good ore is being opened up between the 380 and 280 levels, and the stopes in the southern end of the mine recently made a production of increased value. The crosscut on the 600-ft. level from the Combination Fraction has not exposed ore. In general, the Combination mine showed marked improvement over the previous month.

Mohawk Mine—A very large body of $12 to $15 ore is being exposed on the 250-ft. level between the old Hayes-Monnette and Frances-Mohawk workings. On the 450-ft. level, a drift recently exposed a considerable amount of low-grade ore in the hanging-wall of the old MacMillan lease on the Gold Wedge. On the 600-ft. level, drifts on the foot-wall orebody have continued on medium to low grades. During the month some of the richest stopes were allowed to remain idle in order to compensate for the very rich ore produced by the Jumbo.

Red Top Mine—Near the south end of the 260-ft. level the stopes are being widened to 20 or 30 ft. and the grade of ore produced remains at about the general mill average. A recent raise crosscutting the vein shows at one point a width of 50 ft. averaging about $40 per ton. Between these stopes and the surface, a promising territory is as yet undeveloped. On the 330-ft. level, the same oreshoot has been encountered and drifted on for a length of 150 ft. Its width is not yet determined. The north end of the 330-ft. level has connected with the stope of the old Mushett lease. During the month the stopes continued their excellent production.

Jumbo Mine—On the 600-ft. level from the Clermont shaft, exploratory work was continued from the north crosscut without results of comercial importance. Stoping was commenced on the 750-ft. level and the indications from drifting are fully confirmed. On an intermediate level about 120 ft. above the 750 level on the dip of the vein, ore of about $100 grade has been exposed for a length of 100 ft. Stopes are being started on the 900 level with good results. Raises will soon connect the 900 with the 750 level, and the 750 level at its extreme south end with the Mohawk 600-ft. level, insuring good working conditions throughout these levels. Crosscutting is progressing rapidly on the 1000-ft. level and the probable position of the orebodies should be reached within the next month. All preparations for production on a larger scale are complete. During the month of November, there were produced from the Clermont shaft 2422.7 tons containing $357,722, an average of $147.50 per ton.

Mill Construction—All of the material necessary to increase the equipment of the Consolidated mill has arrived, and its installation has been nearly completed without delaying or interrupting the regular operation of the mill. It is believed that by Jan. 1 the mill will be operating regularly under increased capacity.

Required, a New Pair of Glasses

BY FRED C. KEIGHLEY*

During the last eight or ten years there have been many mine accidents and the explanations given or advanced for the causes of these accidents have been numerous. I am going to grant right now that accidents happen from many causes, from carelessness, neglect and incompetency. Some accidents occur from the lack of properly gaging conditions and the failure to use good judgment when something out of the ordinary occurs. However, it would seem that one possible cause of some accidents has been overlooked, in fact, I might say that this particular cause of accident may be the very foundation of most of the causes for accidents.

As all coal-mining men know, there is only one gage in existence at this time which is generally taken as a standard for testing a man's ability and knowledge of mining operations, and that is the old-time cost sheet, a sheet that is made up each month or year and shows the cost per ton of producing coal. For the purposes of this article it will not be out of the way to consider this cost sheet in the nature of a pair of glasses through which the operator sees his business. We all know that a standard or gage of some kind is necessary, but if the standard or gage itself is not reliable it should be evident that everything that is built up or compared with such a standard or gage is liable to be very much in error. The truth of the matter is that there is nothing on earth more misleading than the ordinary cost sheet; in fact, I do not know of any cost sheet in existence at this time that will correctly determine the ability of the management or the real productive capabilities of the operation of which the cost sheet is popularly thought to be the gage. The question naturally arises that if the cost of producing a ton of coal is not the proper method of ascertaining the true status of the operations and the management connected therewith, what other method could be put in use? Or, what other method could anyone suggest?

Before taking up that side of the case it will be proper to see, if possible, why the old cost sheet does not tell the truth, and it certainly does not often do it unless it should be by accident. In the first place, the cost of anything does not cut much figure unless there is a selling price in connection therewith. It does not matter for what purpose coal is produced if there is not a selling price somewhere in connection with it. In other words, people are not in business for the purpose of seeing how cheap they can produce an article but for the purpose of trying to get all the profit possible out of the article in question. If a coal-mine operator could produce coal for 10c. a ton and could get but 8c. a ton for it, it is then evident that the cost sheet is no gage of the business. The present method of determining the efficiency of a mine's management wholly by the showings of the cost sheet is all wrong; therefore it is impossible to ever build up anything positively reliable from its showings.

One experience in the way of cost sheets in the earlier days of my mining experience came very near discouraging me with the mining business generally. It was my fortune or misfortune to follow a certain manager who had charge of a mining operation, and while this man was what was known as an old-time, solid, practical man, yet he seemed to have had a very impractical way of doing things; for instance, if the morning was fine and there were no other attractions, the manager would leisurely walk to his office in a pair of slippers about nine o'clock and the occasion for his being there promptly was the receipt of the morning paper which was thrown off the train at that time each morning. This paper pretty generally engrossed his attention until eleven o'clock when he would begin to get a little restless and would then walk toward his residence which was located a quarter of a mile away. About two o'clock the same old slippers would carry him down to the office again. By that time the operations of the day were pretty nearly over and he would join in a game of tennis or croquet, and this is a fair sample of the way he put in his time. Some remonstrance had been made about these peculiarities of his but he always met them with the statement that he was not paid for any work he might do but for his experience. There is no doubt the man did have experience, and I believe he was a man of more or less ability, but he was simply resting on the laurels of former cost-sheet determinations. However, his employers did not let him rest there very long.

As before stated, I succeeded him and about the first thing brought to my attention was that the cost sheet had been behaving very badly for sometime back and something must be done. Consequently, I tackled that cost-sheet problem with considerable vim, and as a natural consequence, the cost of producing coal was soon on the decline. Each month when the cost sheet was duly forwarded to the city office, a nice little note would be returned saying, that is good but can't you do a little better? I naturally tried to do a little better and in trying to do a little better, did some things that were not the wisest things in the world, but the cost sheet seemed to be the sole standard of my work and I was anxious to cultivate a pleasant acquaintance with such an important representative.

Things ran along five or six months, the cost going down, finally getting to a point where I did not see where it could go down any farther, but did have serious fears that there would be a turn in the tide and the cost would go up again. About this time, I began to do a little figuring for my own special benefit and in order to figure intelligently, I naturally looked back over the statements and the several notes of encouragement and recognition of my efforts to bring down the cost, and found that it did not seem to matter how much the cost went down in a certain month there was always the question, cannot a little better be done? Following along this line it occurred to me that if a continual reduction could be kept up; a time would arrive when the coal miner and working man would be paying the company for the privilege of working. It then dawned on me for the first time that it was impossible to reduce costs below a certain figure, no matter how much my employers wished a reduction, and long before that point was reached there was a point where danger would shove in its nose.

What I have just related took place nearly 30 years ago and since that time, the thought has often occurred to me that possibly many a mine and many a manager's reputation have been wrecked in the vain attempt to reduce costs to the point that some other mine operator claimed he was producing coal for. It will probably be admitted that the cost per ton of coal is not a safe standard for the mine operator to adopt as a sole gage of the ability or work of his officials, but the statement will likely be made that it is the only practical test or gage available.

A New Way to View Things

Having in a way attempted to show that the mine operator needs a new pair of glasses, as it were, through which to scan his business and management, it will next be in order to suggest something in the way of a system or method that might be likened to a new pair of glasses through which the operator or mine owner would be able to judge of the work of his officials and the possibilities

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NOTE—Paper read before the winter meeting of the West Virginia Coal Mining Institute.

of his mining property. Up to this time the bulk of the coalfields under operation have been acquired by purchase; possibly 95 per cent. of all the coal lands operated in the United States today are owned in fee by the operators of the properties. When the properties were acquired, they were not purchased by the ton but were generally purchased by the acre. Such being the case then every acre of that property bearing workable, merchantable and profitable coal represented a unit capable of producing a certain amount of profit. If a firm buys 1000 acres of coal, that 1000 acres represents that many units of the possibilities that the future of their property has in store for them, and the possibilities of that future cannot be weighed out by the ton but may be designated by the acre unit or by the 1000 units or acres. Such being the case, would it not be best to take the acre of coal as the unit of measure of the profitableness of a mining property instead of taking a ton of coal as the unit of the cost of production and making it the gage of the results?

Profit per Acre Is Best Way

I think it can be proved that the standard here proposed for determining the efficiency of a mine official will be far superior to the method now in use. The great difficulty about a cost sheet based on the ton of coal produced, is that the conditions in any one month's operations are rarely, if ever, exactly like the conditions of other months; therefore it is unjust to the mine official and possibly ruinous to the mine owner to adhere to and be governed alone by the showings of the tonnage cost sheet. On the other proposition the mine owner or the mine official knows positively that if he has 1000 acres of coal to begin with and he mines out 100 acres of coal during a period of 12 months, he will have only 900 acres left. Reverting to the tonnage cost sheet, the fact that coal costs so much per ton over a certain period does not indicate anything at all beyond the actual expenditure of money which may have been wisely or unwisely laid out, and in many cases without any consideration for the future whatever. It might be that the cost per acre would be a fairly good method, but I am inclined to think that the profit per acre is the only true way of gaging mining operations.

For illustrations we will say that a coalfield of 1000 acres has been operated for 12 months and has reduced its area 100 acres. It is a self-evident fact that 1/10 of the natural resources of that operation is gone forever. If the results as shown by the acre profit sheet demonstrate that no money has been made on the 100 acres, it is then very evident that the other 900 acres will have to carry what was lost on the first 100 acres. No cost sheet ever devised, based on a ton of coal, will demonstrate that fact so clearly. The monthly cost sheet, while showing the expenditures for that particular month, is extremely misleading inasmuch as coal may have been produced at such a low cost that coal was sacrificed, and when coal is sacrificed that means tonnage has been lost, and the cost being based on tonnage produced, the whole system is certainly misleading, while the reverse is the case with the acre system or method. It is not my intention to advocate the total disregard of the cost of production, as an account should be kept of the cost per ton, but the real question at issue is the profit that could be derived from the 1000 acres of coal. Capital was originally locked up in the 1000 acres and if that capital is not returned with good interest through skilful work and in a legitimate way, no matter how little the cost of coal per ton might be, the result would be failure, ruin, and probable disaster.

There are some, no doubt, who will say that even a statement based on profits per acre might be misleading. This to a certain extent may be true, but not if the idea is intelligently followed out. For instance, before determining the profit of the year per acre, the acreage of coal remaining unmined would certainly have to be accurately measured up, and if this is not accurately measured and the attendant conditions of the locality from which the coal was extracted during that period considered, it would be misleading. These conditions can be ascertained; the acreage can be ascertained, and therefore there could be no question as to the actual state of affairs in existence at the end of each year. This will not only afford a reliable gage for the work during the 12 months, but of what may be expected in the succeeding years, and more than that, what will absolutely have to be done before the full possibilities of the property can be attained. Each year's work and the accumulation of years would be indicative of what must be done the following years. No tonnage-cost scheme can possibly do this for the reason that it is impossible to tell what damage has been done to the future possibilities of the property by making an apparently low record for cost; but where the acreage system is used the damage would be shown up at once as the engineer in making his surveys would note how much solid coal was left, how much coal was available under development, how much remained in the form of pillars and protection to the property, and the conditions surrounding each particular item constituting the whole.

No doubt the question will be asked, How is one to know during the 12 months what is going on under the acreage system, as it would be necessary to wait for 12 months before having a tab on the business? The answer to this is that valuable as coal now is, important as mining operations now are, and the necessity for guarding against dangers of all kinds which are becoming more and more frequent each year, it is both expedient and profitable to make monthly measurements and thus approximate the acreage each month until the end of the year when such acreage can be determined by an instrumental survey. The acreage-profit system as a preventive to accidents is certainly far superior to any system or systems of cost determinations now in use, unless it should be that some mining concern has already adopted a similar method; and if such is the case, I have no doubt they are perfectly satisfied with the system.

The attempt to produce coal at phenomenally low rates has often not only deceived the mine owner, but in more than one known case has been the very creator of disaster to the operator and death to the worker; hence the great need of some other method of gaging mining operations, being adopted by the producers of coal.

A Coal Miner Brings Suit Under Peculiar Circumstances

Special Correspondence

A foreign miner has brought suit in the United States court against the Delaware and Hudson company for injuries received while at work in the Marvine mine near Scranton under peculiar circumstances. The miner was working in his chamber, he alleges, tamping powder in a hole when the shot was prematurely fired not through any carelessness on his part, but owing to the explosion of a small pocket of gas in the vicinity of the place in which he was working. He alleges it was negligence on the part of the fire-boss not to have discovered the pocket of gas, and that if he had discovered it, he should have reported the fact to the mine foreman, and the mine foreman should have in turn reported the matter to him. He does not know whether the fire-boss did his duty in the premises, but he claims that the inside foreman did not inform him of the presence of the gas, and that therefore he received his injuries through the negligence of the company through their servants.

Shipments of Mexican onyx from Lower California during 1909 will exceed in value those of any previous year, according to American Consul George B. Schmucker of Enseñada. For the 9 months ended Sept. 30, onyx to the declared value of $85,000 was exported to the United States, against only $66,647 for the full year 1908. This onyx, it is stated, will be used in the interior of the new peace-congress building at the Hague. The polishing of the onyx is done by a San Diego, Cal., firm.

A Detailed Study of Practical Fuel Values

BY W. P. YOUNG*

Everyone connected with a coal company is familiar with the fact that we receive complaints from the consumer. Generally speaking, are these complaints justifiable? Is the producer altogether at fault? How many troubles arise through selecting the wrong coals, or handling them wrongly when received?

As a sidelight on these and similar questions, it may be of interest to consider some of the effects accompanying relatively small and seemingly unimportant differences and changes in physical, mechanical and chemical properties of various fuels, with reference to their practical fuel value, more especially in metallurgical operations.

For many years there has been a persistent belief that coal should be very lumpy in order to be good. There are some grounds for this belief, but the better effects found with lumpy coals are nearly always due to furnace conditions and not to the fuel. The modern idea of selecting a fuel suited to local conditions is gaining ground and it should be observed that this does not always mean the selection of a fuel highest in heat units, as coals of lower theoretical value may give better results.

In a recent engine test on one of the Eastern roads, a fuel running under 13,000 B.t.u. replaced one of over 14,000, it being found necessary to use 25 per cent. more of the latter to make the same engine mileage. This was due to the lighter gravity and finer condition of the higher valued coal, a considerable quantity of which was lost by reason of the powerful draft.

In one of the large steel plants certain furnaces were heated by coal, the bed of fuel being about 2 ft. in depth. It was found to be more economical to use a coal running 5 per cent. higher in ash than another, on account of the clinkering of the latter and consequent loss in the frequent cleaning of fires. If the coal used be of a coking nature, the presence of fine coal does not usually cause any diminution of available fuel value.

When the blast-furnace man demands a coke that is solid and in comparatively large pieces, he is not actuated by any whim, but really needs such a fuel. To him the principal use of coke is to reduce iron from its ores, but as a matter of fact, the actual quantity so used is small compared with that used in heating the slags resulting from the earthy matters of the ores, limestone and coke ashes, together with the losses of fuel in burning to carbon dioxide in the upper zone of the furnace, without doing practical work. By far the larger amount of ores now in use are very fine and if the coke be in large pieces, it tends to prevent the packing together of the ores and the obstruction of the blast.

Small Coke Is Sometimes Best

Large coke presents much less surface, per ton, to the action of the blast, than does that in small pieces, with a corresponding minimum loss, by burning to carbon dioxide, before doing reducing work. The film of graphite, found on some well burned and well drawn cokes, prevents the penetration of the blast and thus saves fuel. On the other hand, if the coke be spongy, the loss from the above cause will be high, if indeed a good deal of fuel is not crushed by the weight of the stock and blown through the gas passages.

In the carriage and storage of soft coals, the presence or absence of slack is an important factor. When moderately lumpy coals are handled roughly, as in dumping cars by turning them over, a small percentage of slack mixed through the lump prevents breakage to a degree that is surprising, though if the coal is to be stored for any length of time later, this good effect may be more than offset by the increased liability to spontaneous combustion, by reason of the slack preventing the access of air to the interior of the pile, as well as the fact that the slack gives up its hydrocarbons more readily and in greater volume at ordinary temperatures than does the lumpier coal. In fact it would appear that there is a decided tendency in some slack coals for the hydrocarbons to assume the gaseous form whenever the coal is finely enough divided.

This seems to be more particularly the case with those coals whose breakage produces a very fine greasy kind of slack, from which water runs without leaving a trail of wet coal. This greasy nature is probably due to both chemical and physical conditions and is a deciding factor in spontaneous combustion on storing. Slack of this nature results from the breakage of a coal that is tough rather than hard, the harder coals usually breaking down into a coarser slack and one having more definite cleavage planes.

It would appear that the composition of the coals, in the seam, is gradually changing, this change being more marked where the coals are exposed in the outcrop, or penetrated by streams of water. The hydrocarbons composing the volatile matter seem to undergo more or less decomposition with resultant changes on the rest of the coal and the production of various gases, which are either occluded, or mechanically held in the crevices of the seam. While the real nature of the volatile matter, as it exists in the solid coal, is not well understood, if indeed at all, yet it is known that various compounds were formed according to the heat and pressure, when the coals came to their present condition, and generally the volatile matters of superimposed seams are similar in total percentage and character if the seams have the same physical properties; for instance, the same hardness, cleavage and appearance of slack.

There is a relationship between the physical properties of the coal and the state of combination of its volatile contents and may I suggest that possibly the very high explosive power of some coal dusts may be due to their being loosely held together in some higher organic compounds.

The coking process depends more on the nature of the volatile matter than upon its quantity, provided there be enough present to keep the ovens in condition to fire the succeeding charge of coal.

When the charge in the beehive oven catches fire quickly, the coke will be solid in structure, while if the coal remains in the oven for an hour or more after the charge is leveled before catching up, and if it then comes to a semi-plastic state slowly, the coke will be spongy and carry more of the sulphur from the coal. A simple wetting of the slack before charging, will materially reduce the sulphur contents of the coke.

Coke men are apt to consider complaints of slightly higher sulphur and phosphorus as being whims, claiming that the furnace man uses ores running many times as high in both these elements without much trouble, but the cases are entirely different, as the sulphur and phosphorus in ores, mill cinder, etc., are liberated from them before they pass below the tuyeres of the furnace and consequently have a chance to get away, either in the gaseous state, or in the form of slags combined with lime, while the same elements in the coke pass with a certain amount of the solid coke down into the crucible of the furnace and are there greedily absorbed by the iron and it is then too late to remove them by means of lime.

The Cause of Clinkering

The clinkering of coals in furnaces is

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NOTE—Abstract of paper read before the West Virginia Coal Mining Institute, Huntington, W. Va., December 7, 1909.

a source of great losses in efficiency. Clinkering is caused by the presence of iron, or lime in the ash, or by the melting of the coal before combustion. The results of clinkering are direct losses of solid fuel dragged out in cleaning fires and the heating to the melting point of slags of various compositions, requiring the use of fuel otherwise doing efficient work. Red coal, which commonly carries a notable percentage of iron oxides, combined with water, is an illustration of these sources of loss. The iron oxide is reduced to metallic iron, with attendant formation of silicate of iron, and forms a particularly mean clinker with its attendant losses of heat and solid fuel. As most of the red coal is also soft and will melt under heat without complete combustion, we have a combination causing much complaint. It is surprising, however, to note the relatively great loss of heat in a coal that is so slightly different from the original solid, black fuel, as to be almost unnoticeable. This loss of heat is more frequently found where boilers are being overloaded and as a rule the consumer has no real idea of his trouble, simply complaining that the coal "won't make steam" or that it has no "life." Red coal, however, has one good point, in that it usually carries very little sulphur, and consequently can be used where an excess of this element is prohibited.

On account of the fact that the red coal has undergone changes in its volatile contents, it does not make good coke in the beehive oven.

The amount of foreign matter, as slates, bones and sulphur streaks, is usually overestimated, the total percentage in any half decently prepared coal being very small. It is rarely the case that the total visible foreign matter in soft coals reaches two-tenths of one per cent. of the whole, yet one-half of this amount will bring forth strenuous complaint and the assertion that the coal "was half bone and slate."

If the foreign matter is a light bone, it will do no harm in ordinary practice and will not reduce the available heat units at all.

Slate is inert and only causes real losses by interfering with the draft when lying on the grates. The total quantity is too small to materially lower the available heat units.

While slates and sulphurs should be removed in all cases, it is doubtful if we should yield altogether to the whims of the consumer in the matter of the removal of the lighter bone coals, as they have a definite fuel value and should therefore be used. Some day those following us will reproach us for the wanton waste of many thousands of tons of good fuels in days gone by in order to satisfy the unreasoning demands of consumers.

Influence of the Underground Mine Manager

BY JOSEPH VIRGIN *

Twenty-five years ago, when laws relating to coal mining in this country were enacted, most of the States passed a law compelling the employment of a certificated mine manager, or foreman for each mine of 10 or more men. The result was a lot of small-caliber men, salaried at from $50 to $75 per month. It also produced some fine men, who studied hard; but salaries were low, because the mines were small, and the labor unions and the various mine departments insisted on the one mine one man principle.

Soon, however, the companies began to assemble these small properties under one head. The broader, and more astute managers soon found these men too small, and the better men would not work for the salaries paid. Hence they soon developed the mine superintendent, the general mine foreman, the company mine inspector, or underground manager. All different names with the same kind of a job, with certificated men under their charge.

In West Virginia they have not yet reached the certificate stage; but the law compels a practical overseer who has had practical experience, to manage one or a dozen mines. It is of this man that I wish to speak.

This manager is surrounded by a peculiar pressure from three points—law, labor and owner. He is everlastingly prodded by these three forces. The law says keep your mines in a strictly safe and sanitary condition, and is full of Thou Shalts and Thou Shalt Nots. Labor says: We want the mine perfectly safe and sanitary; however, we cannot see why the miner shall not shoot from the solid, or leave timber out, get off the sights, or use any old kind of powder, or lay out his shots to suit himself; he is doing the digging piece work, and it's a free country, isn't it? The owner says: "Well, Mr. Jones, we are very glad to note that the inspectors give our mines a fine report. This is all that can be desired. You are getting on fine with your bosses and assistants; but, can't you reduce your cost sheet a little?" This, then, is the underground manager's dilemma; and thrice blessed is he that can satisfy law, labor and owner!

Since the development of modern methods, the manager must have larger qualifications, and salary. He must thoroughly understand ventilation; know how to erect a fan; construct overcasts; build permanent stoppings, and have doors properly adjusted. There are lots of mines putting 40,000 to 100,000 cubic feet per minute in the intake, and not one-quarter of it reaches the faces of the entries! I remember going to a mine where a Crawford & McCrimmon fan was erected with the blades turned to hook the air out instead of throwing it off at a tangent, as the makers intended.

Necessary Qualifications

Then, in these days the manager should be a fair electrician; not to do the work, but to understand the diseases of locomotive and stationary motors, with the remedies for the same. Many mines have been kept at work the remainder of the day because the underground manager could point out a remedy for a disabled fan-motor, or locomotive, until it could be got to the repair shop at night, or another part supplied. The manager must also understand hydraulics, and pumping arrangements; he must know where a siphon can be used instead of a pump.

I remember visiting a mine for a company which had a man pumping water every day at $1.75—about $600 a year. He was pumping over an 8-ft. rise, with a 40-ft. fall. We placed the pump on the outside and siphoned the water out. I can point you to a mine where they used a steam pump and paid 22c. per hour for labor 24 hours per day 365 days per year. The underground manager insisted the water could be drained. The surveyor said no; but the manager still insisted. The company bought him a transit. He took levels, and spent $300 cutting a ditch. That pumping plant has been cut out for the last 5½ years, saving $2000 yearly for the company; the manager got $300 a year more salary, too.

The underground manager should thoroughly understand the nature of the roof, the coal and the floor. His influence is for good or bad to the general safety and economy of a mine in direct proportion to his knowledge of existing conditions. The manager must also know a great deal about the diffusion of gases, for as the workings get farther in, they produce more blackdamp and more firedamp. How to take care of the blackdamp and firedamp from a thousand

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Note—Address delivered before the West Virginia Coal Mining Institute, Huntington, W. Va., December 7, 1909.

*General superintendent, Plymouth Coal and Coke Company, Plymouth, W. Va.

acres of old workings without carrying it over your men has bothered more than one brain. The probabilities are that blackdamp has brought more men to a premature death than firedamp; this has occurred one at a time, however, and therefore has not produced public spasms, like those resulting from explosions.

I can point to a mine where there is one-half square mile of old workings in one panel, with provisions being made to close all apertures, but one, to this block, circulating 5000 to 10,000 ft. of air around this and over the overcast to the return. This block will give off 500 to 1000 ft. of CO_2 per minute, giving 5000 to 10,000 feet of blackdamp. The safety of such a mine is directly proportional to the underground manager's knowledge of these matters; for, as the miners advance, block after block must be separately ventilated, requiring, say 10,000 ft, at each block; therefore, in five blocks you have lost 50,000 ft. of air; and you must still have the 50,000 ft. to ventilate the working faces with pure air. Of course, you could, and many men do, as a noted expert advised us to, hermetically seal these blocks off; however, with the ever impending danger of falls breaking open the seal, and suffocating or burning lots of men, it seems best to blow this gas outside for the vegetation to absorb.

PROBLEMS THAT SHOULD BE UNDERSTOOD

The underground manager must understand various systems of haulage, such as ropes, electric motors, air motors or gasolene motors, not to mention the original tandem-compound mule team. When to use one, or the other, or several of them, is also a problem worthy of the best thought of any man. Then he must be acquainted with gradients, know practically what a machine can haul, or he may advise his company to buy the wrong machine. Hence he should know the virtues and failings of these engines.

The manager should know a great deal about track, the weight of rail, the size of tie to carry a given weight, always considering as he advances he is liable to need larger engines, and longer trains. He should know what number of frog to use to turn off at a given angle at any entry, how long the rails must be to complete that switch, the number of frog and length of rails for a siding switch, etc., so that he may be able to give the blacksmith the proper dimensions. The great problem today is, not how to reduce the cost of production, but how to keep the cost stationary as the workings get a mile or two from home.

The underground manager must also be a man of indomitable courage and not easily worried, or he will fall by the way. As a rule, this man can and does command a salary from $125 to $200 per month. When he commences his reforms, he will have all the old traditions to overcome. There will be head-shakings, and heart-burnings and dissensions, and more than one of his assistants and workmen will visit the office at opportune times and prophesy dire calamities. The underground manager, therefore, has troubles that try men's souls, but if he has courage and hope, and good judgment, and the above qualifications with a little backing from headquarters, he will succeed.

A successful manager must also be a good judge of human nature; for, although he does not come in as close contact with the men, as does the inside foreman, he must be able to adjust troubles between these two forces. He must have assistants that believe in him and his methods. In a word, he must be a practical rather than a technical mining engineer. He must be conscientious, letting his word be his bond among his workmen. His men will then look up to him and respect him. As a rule, the more technical books he reads and the more mining methods he has seen, the better he is.

Some years ago the chief mine inspector sent letters to various West Virginia operators, asking their opinions as to examining mining officials. One large operator replied that the best mine foreman he ever had could not read or write. With due respect to that statement, I wish to say he would have been a much better foreman if he could read and write.

Senate Asks for Information on Mine Accidents

SPECIAL CORRESPONDENCE

In response to a resolution presented by Senator Cullom the Department of the Interior, which in this instance means the Geological Survey, has been called upon for a report with reference to the number of rescue stations that have been established for the purpose of preventing loss of life in mine disasters, the number of such stations needed and the probable cause of the numerous recent disasters in mining. It is supposed that this information, when delivered, will lead to a thorough discussion of the question of Federal intervention in mining in such a way as to secure the application of supposedly safe methods wherever possible. The resolution was opposed by Senator J. W. Bailey who said:" I deny the power of the Federal Government to undertake in any manner to supervise a mining operation within a State. Mining, manufacturing, and agriculture, at least up to this time, are free from Federal interference and Federal supervision. Just how long they will remain free under the modern tendency I am not able to say, but it shall be as long as I have a vote to cast, at least so far as that vote might be effective."

The resolution was finally adopted (Dec. 16) on the ground that it merely called for information. It reads as follows:

Whereas disasters are of frequent occurrence in the mines of the country, resulting in appalling loss of life and injury among men engaged in this industry;

Whereas there has occurred at Cherry, Ill., a disaster of terrible magnitude, resulting in the death of about 300 persons: Therefore be it

Resolved, That the Secretary of the Interior be requested to inform the Senate:

1. The number of Federal stations equipped with rescue appliances which are in operation in the mine fields.

2. The number of Federal stations essential to the proper safeguarding of life which should be established in the mine fields, with an estimate of the cost of their construction and operation during the next fiscal year.

3. The opinion of the mine experts of the Department of the Interior as to the causes of the numerous accidents and their views as to the action the Federal Government should take to prevent or at least minimize them in the future.

A reply will probably be made at an early date.

The American company operating a zinc mine at Boquillas, Coah., has made application at Washington for a subport of entry for the purpose of admitting the zinc ore into the United States by means of a tramway across the Rio Grande from the mine on the Mexican side. The property was at one time extensively worked for lead for the St. Louis and Kansas City smelteries, but was abandoned until about a year ago, when it was taken up by Carlos Mosher and a company formed to exploit the zinc and to provide for transportation across the Rio Grande and to the railroad point in Texas, a distance of about 90 miles. The property has a large tonnage of zinc ore developed and is considered a possible steady producer of zinc ore.

The Center Star Group of Mines, Rossland, B. C.

Ores in Monzonite; Incline Shafts Used; Shrinkage System in Narrow Veins, Square Sets in Wide Veins; Large Drills in Stopes

BY ROY HUTCHINS ALLEN*

The Center Star group includes the Center Star, War Eagle and Iron Mask mines of the Consolidated Mining and Smelting Company of Canada, Ltd. The mines are in the heart of the mineralized territory at Rossland, and are among the most important of the Boundary district.

Geology

The country rock of this region is a westerly-dipping series of Carboniferous sediments, chiefly slates, which at Rossland has been intruded by an elongated, roughly oval-shaped mass of monzonite. This mass, which underlies the city of Rossland and the hill immediately to the north, is surrounded by a border of varying width of augite porphyrite and diorite porphyrite. There are also many occurrences of porphyritic monzonite, both adjacent to and also separated from the main mass of monzonite. All of these rocks are regarded as derivatives of the same magma.

This monzonitic mass, together with its rim-rocks, has been intruded by a large number of nearly vertical dikes, from a few feet to 250 ft. thick, and with a general north and south trend. The dike rock is a dark, almost black rock of medium to fine grain, and contains many flakes of biotite. It is locally termed mica trap, and from superficial examination it may be a kersantite, or altered basalt. The dikes are somewhat softer than the country rock and are occasionally slickensided, as was noted particularly in the Josie mine of the Le Roi No. 2 company.

The veins, which are at nearly right angles to the larger dikes, are cut off completely by them. They occasionally pass through the smaller dikes, but more frequently stop at one side of the dike and continue in the same line on the other side. At the point of intersection there is often a large and important orebody. The indications are that the veins were formed subsequent to the intrusion of the dikes, and that the ore was deposited from heated solutions immediately following this period of igneous activity.

The veins have since been cut by a series of faults nearly parallel to the dikes. These faults, for the most part, have a strike of approximately north 10 deg. west, intersecting the veins at nearly right angles, and are vertical or have a steep dip to the east. They are normal faults and produce apparent horizontal displacements of the veins varying from almost nothing up to 100 ft. or more.

*Mining engineer, Lunenburg, Mass.

The Vein System

The veins are roughly parallel to each other and have a strike varying from north 40 deg. east to north 75 deg. east. All have a dip toward the north. They are found in both the monzonitic mass and in the surrounding sedimentary rocks, but those portions which have proved most productive lie almost wholly within the border of porphyritic rock on the western side of the main mass of monzonite. It is within this portion that the important mines of the district are situated.

The Center Star mine has one vein, the Center Star, upon which the shaft was sunk. This vein has a strike of about north 60 deg. east and a dip to the northwest varying from 70 deg. in the upper workings to about 20 deg. in the lower levels. In the War Eagle mine there are two principal veins: the War Eagle, having a strike of north 10 to 20 deg. west with a dip of about 50 deg. to the northeast; and the Josie vein which intersects the War Eagle at an angle of 60 deg. and dips toward the northwest at an angle of 74 deg. The Iron Mask claim has three important veins, two of which are nearly parallel and are intersected by the third at about right angles. In addition to those mentioned there are several smaller veins upon which no work is being done at present.

Where there are intersections there is usually a swelling of the veins and also a slight displacement of both. Orebodies of considerable size, 25 to 30 ft. in width, are often found at these intersections. The veins show little or no banded structure and are to be regarded as impregnations and replacements of the country rock along planes of fracturing. In only a few instances is there a definite wall to the vein.

The ore minerals are pyrrhotite, pyrite and chalcopyrite, named in the order of their importance. All are auriferous, but the greater part of the gold occurs in the pyrrhotite. The ores of the district average from 0.7 to 2 per cent. copper and from $10 to $20 in gold, though ore worth $50 to $100 per ton is not uncommon. The metallic minerals occur as solid masses of the mixed sulphides, as small stringers and ramifications and as disseminations through the vein rock. The gangue is chiefly the altered country rock with an addition of silica. The ore occurs in shoots from 50 to 500 ft. in length and from 3 to 50 ft. in width, though in some places the latter width has been exceeded.

War Eagle Mine

The War Eagle mine has a three-compartment shaft, 1650 ft. deep, sunk on the War Eagle vein at an inclination of 50 deg. There are two hoisting compartments, one 4 ft. 6 in. by 5 ft., the other 5x5 ft., and a manway 5x5 ft. in the clear. The shaft is provided with cages, completely housed on three sides and open in front, which are operated in balance by a geared hoist of 300 h.p. The hoist is run by compressed air received from the compressor at the Center Star mine at a pressure of from 90 to 100 lb. per sq.in. This air is reheated at the War Eagle shaft before being used by the hoist.

The shaft house is connected by an incline tramway with the railway ore bins which are about 1100 ft. distant and 300 ft. lower than the shaft. The incline is no longer used, for all ore from the War Eagle mine is trammed through crosscuts 1200 ft. to the Center Star shaft. The hoist at the War Eagle shaft is used solely for handling men and supplies, and for hoisting waste from the development work. The surface plant on the Iron Mask claim has been dismantled and the mine is worked through the Center Star shaft.

Center Star Uses Cages and Skips

The Center Star mine has a three-compartment shaft, with two hoisting compartments and a manway, each 5x5 ft. in the clear. The shaft is 2300 ft. deep and ha a dip of about 69 deg., having been sunk on the Center Star vein. The hoisting compartments are provided with cages 10 ft. high, boxed on three sides and open in front, and having a hinged bottom which is thrown back when hoisting ore. To the bottom of the cage is attached a 4-ton skip. Men and supplies are lowered in the cage, and on such occasions a cage tender always accompanies it. Electric signals are used, operated with current from the lighting circuit. The shaft has guide timbers, 6x6 in. in section, and both cages and skips are provided with guide shoes, and the former with safety catches.

The cages are operated in balance by a Nordberg first-motion hoisting engine, having cylinders 28x60 in., and two cylindrical drums each 10 ft. in diameter with a 5-ft. face. The hoist is rated at 1100 h.p. and hoists a load of 10 tons from a depth of 3000 ft. at a speed of 2000 ft.

per min., with steam pressure at 120 lb. per sq.in. A 1¼-in. plow-steel hoisting rope is used. The steam for the hoist is furnished by three internally fired boilers, but on account of the high price of fuel it is planned to discard these and operate the hoist by compressed air, reheated at the engine room.

The shaft house is 106 ft. high, built of heavy timbers strongly braced. The sheave wheels are 11 ft. in diameter. The ore skip dumps over a grizzly into a bin of about 160 tons capacity, from which a 24x36-in. Farrell-Blake crusher is fed. The crusher is driven by a 75-h.p. alternating-current motor. A belt conveyer delivers the broken ore to a distributing conveyer which discharges into the bins. There is a large bin for waste, two bins for coarse ore (1 in. to 4 in. in size), and two for fine ore (1-in. and under).

CENTER STAR MINE, ROSSLAND, B. C.

WASTE SOLD FOR RAILWAY BALLAST

During the day shift, the ore bins are discharged through an oscillating trough feeder to a link-belt conveyer which discharges to a second conveyer, there being one set of conveyers for the coarse and another for the fine ore. The second conveyers carry the ore up an incline into the sorting house, where the waste is removed by ten men, nine of whom work on the coarse ore and one on the fine ore. The conveyers deliver the cleaned ore to a Vezin sampler which takes one-tenth of the ore as a sample.

The sample passes through the sampling plant, directly underneath this point, while the bulk of the ore falls on a link-belt conveyer of different style which travels over the railway bins and by a dumping arrangement delivers the ore to any bin. The conveyers are all driven by electric motors. The waste which has been removed from the ore falls into bins and is taken to the dump in trains of six side-dumping cars drawn by an electric locomotive. The waste from the mine is hoisted and crushed separately and is sold to the Canadian Pacific Railway for ballast.

The compressor plant contains two compressors. One is a Canadian Rand, duplex, corliss compound steam, two-stage air compressor, with steam cylinders 22 and 40 in. in diameter, and air cylinders 38 and 22 in., with 48-in. stroke. The rated capacity is 3000 cu.ft. of free air per min., compressed to 100 lb. pressure. The steam cylinders have been disconnected and the machine is driven by a rope drive from a 650-h.p. Westinghouse constant-speed induction motor, having a speed of 180 r.p.m. and taking current at 2000 volts. The other compressor was originally an Ingersoll straight-line machine, but it has been built over and a duplex machine formed by the substitution of two Canadian Rand cylinders. The air cylinders are 36 and 23x48 in. and deliver from 2500 to 2800 cu.ft. of free air per min. at a pressure of 100 lb. per sq.in. This compressor is run by rope drive from a 600-h.p. Canadian Westinghouse synchronous motor having a speed of 300 r.p.m. and taking current at 2000 volts. The compressor room also contains a 120-kw. direct-current generator, driven by an alternating-current motor, which supplies current at 250 volts for the electric locomotives, both on surface and in the mine and for the lighting circuits.

The company has a large carpenter shop containing circular and band saws, and a timber-framing machine made by the Denver Engineering Works Company; a blacksmith shop with power shears and punch, power hammers, and two Word Brothers drill sharpeners; and a machine shop well equipped with drills, planer, lathes, pipe threaders and cutters, etc. A special room is fitted up for repairing the rock drills. The company makes its own cars and skips, and in addition to doing all of its own repair work does a considerable amount for other mines.

The electric power is furnished by the West Kootenay Power and Light Company from its plant at Bonnington falls on the Kootenay river, 30 miles distant. Current is transmitted to Rossland at 60,000 volts, and from there distributed to the mines at about 2000 volts.

MINING METHODS

The Center Star mine is opened up by 16 levels, the War Eagle mine by 11 levels. The workings of both the War Eagle and Iron Mask mines are connected with those of the Center Star by crosscuts and drifts. The methods of mining are the same for all of the three mines.

The prospecting underground is done largely by diamond drills, and when orebodies are located drifts and crosscuts are run to them. The drift is cut out for the full width of the orebody and at least 10 ft. high to allow room for the placing of the first set of timbers. If the vein is narrow, that is, not over 12 ft. in width, stulls 12 in. to 18 in. in diameter are placed about 9 ft. above the bottom of the drift and closely lagged with 6-in. poles, spaces being left for the chutes. Stoping is then carried on until at a hight of 8 to 10 ft. above the first row of stulls a second row is placed. This is also closely lagged except that spaces are left next the footwall between the chutes. The ore passing through one of these spaces spreads out in a fan shape on the footwall and supplies two chutes. By this method a free space is left along the hanging-wall between the two rows of stulls, allowing the ready removal of any piece of drill steel or timber which might clog the chute, and also to break or bulldoze rocks too large to pass the chute opening.

The vein is worked out by overhand stoping, the ore falling on the second row of stulls and lagging and being allowed to accumulate there. Only sufficient ore is drawn off to give the men room in which to work. A manway which contains both ladders and air pipes is left at the end of the stope, and is protected by a vertical row of stulls and lagging. The drills used in stoping are nearly all 3⅝-in. Rand machines, a few 2½-in. machines being used in special cases and for work in very narrow veins.

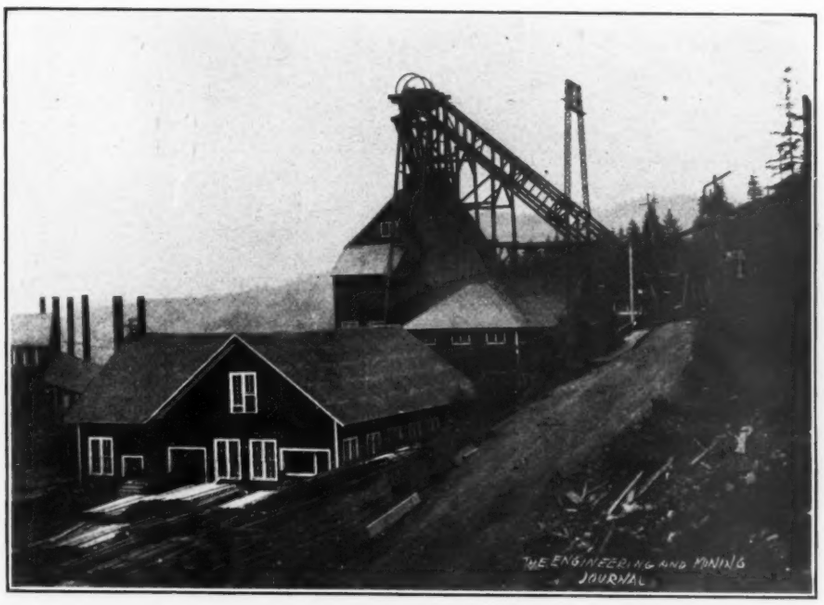
The chutes are of the common type, and the fact that there is little pressure upon them from the ore makes heavy construction unnecessary. The chute openings are 30 in. wide and 20 in. high, and are, for the most part, provided with arc gates.

PRACTICE NOW FAVORS SQUARE SETS

In the newer stopes, even those only 8 to 10 ft. in width, the method which is being introduced by Mr. Purcell, the superintendent, is to put in square sets for two floors in hight starting from the

sill floor, then above the second set to carry the stope up on the broken ore as described previously. This method of timbering gives a stronger support for the broken ore and facilitates repairs and replacements of broken timbers, but as the stope from below approaches this level and breaks through the floor it is necessary to catch up these sets. If the vein is sufficiently narrow stulls are used for this purpose, but if too wide square sets must be carried up from the level below.

In all of the wide stopes square sets are used, and are carried up from level to level. The ore is usually removed as fast as it is broken. The chutes through the sets are staggered to prevent excessive wear of the timbers, and in no case is the ore allowed to drop from a hight of more than three sets. The chutes are placed in every third set along the levels, thus reducing to a minimum the labor of handling the ore in the stopes.



SHAFT HOUSE OF CENTER STAR MINE

The square sets are made of round timbers, 12 to 15 in. in diameter. The sill posts are 9 ft. in the clear, making a total hight of 10 ft. from the sill floor to the first floor of the stope, while in the stopes the posts are 7 ft. high in the clear, giving a hight of 8 ft. from floor to floor. The sets are 5 ft. 4 in. by 5 ft. 4 in. from center to center of the posts. The sill posts are 10 ft. long over all and have a horn 10 in. square and 6 in. long at each end, while the posts of the stope sets are 8 ft. long over all and have a horn 6 in. square and 5 in. long at each end. The caps and girts are each 4 ft. 10 in. in length. The ends of the former are framed 10x10 in. for 6 in. from each end; the latter are cut 6 in. back for the post seats and 2 in. for the cap seats. The squared end is 6x10 inches. The country rock is firm and stands well, and the levels require almost no timbering. However, the ground in and adjacent to the dikes is very heavy and all openings require strong supports.

The ore from the War Eagle mine is hauled by electric locomotives in 2-ton side-dumping cars through crosscuts to the Center Star shaft, where it is dumped into the ore pockets. Electric haulage is also used on the principal levels of the Center Star mine, but much of the ore is trammed by hand in 1-ton end-dumping cars.

LARGE MACHINES FOR STOPING

The ore pockets are cut out on the hanging-wall side of the shaft. There are two pockets on each level, one directly behind the other, separated by a vertical row of stulls. The front bin has a capacity of about 70 tons and is used principally for waste, while the other holds 150 tons and is used for ore. Each pocket is provided with rack-and-pinion gates, below each of which is an arc gate of sheet iron to catch any fine material which might leak through the other gate.

There are 36 air drills employed in the mine, most of which are 3⅝-in. Rand machines. Of these drills 10 to 16 are constantly employed on development work. In the stopes a pair of miners, with one machine, will drill from 30 to 40 ft. of holes in an 8-hour shift, 30 ft. being the rule. The holes are from 6 to 8 ft. deep, the longest steel in use being 10 ft in length. Each drill in the stopes averages from 20 to 30 tons of broken ore in the two 8-hour shifts.

From 1200 to 1600 ft. of development work is done each month. In a drift 6x9 ft. in the clear, the monthly advance is from 120 to 180 ft., the latter figure being the record. The round consists of 10 holes 5 to 6 ft. deep, which advances the drift from 4½ to 5 ft. A round is usually drilled in two shifts. In addition to the air drills two diamond drills are kept constantly at work in prospecting for new orebodies. The diamond drilling is done by contract at $2 per foot, while the drifting, which may be done by contract or not, averages about $16 per foot.

The Center Star group of mines employs about 425 men who average a little better than 1½ tons of ore broken per man. Two 8-hour shifts are worked, the first crew going underground at 7 a.m., and the second at 3 p.m. The change is made underground at the work. At 11 p.m. a crew of four blasters for each mine goes on, and these men load and blast all the holes drilled during the previous two shifts. Any missed holes are reported and listed on a blackboard in the shaft house. This system has greatly reduced the number of accidents, and also makes it possible for the miners to work in good air; for there is ample time for the stopes and drifts to become cleared of powder smoke and gas before the day shift comes on.

The water at the Center Star shaft is handled by a 250-gal. electric pump working 18 to 20 hours per day. A stream of 150 to 250 gal. per min. which enters from the Nickel Plate mine is raised to the Iron Mask adit by a centrifugal pump. The mines are excellently equipped and have an able management. The miners are well paid and there is little dissatisfaction among them. Most of the men own their homes and there is a degree of civic pride in Rossland that is not seen in most mining communities.

Petroleum in Mexico

The future of Mexico as an important oil producer is somewhat dubious. The indications from the extensive development work thus far prosecuted are not so favorable as originally anticipated. The policy of the two large companies is to suppress authentic data on the various fields along the gulf and isthmus; but engineers returning from investigations in these fields for independent interests state that far more brine is coming in than one would like to see. The deposits do not yet promise to be extensive, and in the other wells salt water is appearing in quantity. The famous Dos Bocas well is now little more than a lake of salt water, although during its destruction by fire a comfortable fortune in oil was absolutely lost to the operators. Considerable trouble has been experienced at times with the oil delivered the railroads for fuel because of the brine present. It is difficult to get a contract on fuel oil for any length of time, as the hoped for surplus does not materialize.

Ore Dressing in the Coeur d'Alene District—IV

Elevator Design Good but Speed Too Low; Wash Water Supply Poor; Trommels not Inclined Enough and Driving System Unsatisfactory

BY EDWARD S. WIARD*

Some details concerning Cœur d'Alene elevators will be found in the table which accompanies this article. It will be noticed that many figures are lacking, the majority of such cases being due to insuperable difficulties in obtaining data: The drawings and sketches from which the elevators were erected have long disappeared. In wooden elevator construction the practice is far superior to any of which I have cognizance and my own practice is founded largely upon it. On many minor points of construction there appears to be differences of opinion among the millmen of the region and to reconcile them and treat more fully the points meagerly covered by the table I substitute an outline of my personal experience with bucket elevators for a description of Cœur d'Alene practice. The plans for an elevator fed by a spout passing into the side of the boot and raising ore and water to a vertical hight of 35 ft. are shown in Fig. 2. The housing there shown bears a very close resemblance to that often seen in the district.

*Mining engineer, Denver, Colo.

Front Feeding for Elevators of Little Advantage

In the paragraphs which follow, the remarks unless otherwise specified relate to elevators for raising ore and water, in the Cœur d'Alene region the elevators generally doing this kind of work. No attempt is made to lead one or more spouts around to the front of the housing so that the stream of material will discharge directly into the buckets. At first though this seems to be an admirable way of feeding an elevator but experience has taught that it possesses few advantages. If more than one spout has to be diverted to the front of the housing the loss of head room usually becomes very serious. I have seen the boots of elevators sunk 20 to 30 ft. in pits to obtain this doubtful advantage. Even with a single spout there is a decided loss of head room unless the spout enters the front of the boot, because it will be found advisable to raise the spout so as not to interfere with repair operations at the bottom of the elevator. It cannot be stated too positively that, except with coarse dry ore, elevator buckets will fill just as readily dipping into the material to be raised as when it flows into them. In the matter of wear and tear of buckets, belts pulleys, etc., there is little to choose between the two methods of feeding.

If front feeding is resorted to, and by that I mean that the material enters the front of the housing at some point above the boot, the housing in the vicinity of the feeding spout may be made more trim than shown in the accompanying figures. In these it will be noticed the housing extends out sharply at the wing doors. I have found this extension necessary where elevating large quantities of water and ore which have been spouted into the sides or front of the boot to prevent undue wear from ore cast up by buckets. With front feeding the wing-door portion might properly be drawn in and the boot made shorter than shown in the drawings. Considerable caution should be exercised in doing this. It will be best to err on the side of too roomy a housing. For a front-fed elevator, the housing will have to be, however, wider than shown in the drawings.

The stereotyped design of elevators shown in the catalogs of manufacturers of mining machinery certainly falls short

Fig. 1. Snowstorm Mill near Larson, Coeur d'Alene Mining District, Idaho

of filling all the variable requirements in elevating material in a large concentrating mill. They are practically the design which has existed without change for a long period in the cereal trades. Practically all the cuts in the catalogs show front-fed elevators, a boot and housing placed as snugly as possible around the buckets, and proboscis-like receivers. In some cases toy hinged boots are shown and, often mounted with screw belt-tightening devices which in darkness, dampness and grit do not work as planned.

Details in Construction of Elevators

Beginning at the top, an eye should be secured to a timber above the center of the head pulley for removing broken shafts or loosened head pulleys. These are not infrequent casualties in the best designed elevators. In elevating ore and water the hood should always be left open at the top and be of the lightest possible construction. For very small elevators the hood can be made in a single piece if desired but even in these cases a two-piece hood is more easily handled. In Fig. 3 is shown in detail a corner of the rear or left-hand half of the hood. Stiffness in the hood is secured by the liberal use of angle irons. If acid water must be contended with, the frame and angle irons had better be placed on the outside of the boarding. It is essential that the hood be of the lightest possible construction, for in service its weight increases from water logging and adhering slime.

A cover should not be allowed upon the hood, neglect to inspect the interior surely following such a procedure. If material splashes over the sides of an open hood it is usualy because it has not been carried up to a sufficient hight. A cover on a hood of insufficient hight will be the cause of noteworthy amounts of material being thrown back into the boot. The same objection applies to hinged circular hoods. A board cover on a square-topped hood gains weight from water and slime and even when new and of the lightest construction it is difficult for one man to prevent its falling into the hood while removing it.

According to my rule for belt travel where raising ore and water, the proper hight for carrying the open hood above the center of the head pulley is 1¼ times the diameter of the head pulley. With a 48-in. head pulley and following the ratio just given the top of the hood would be about 62 in. above the top of the timber supporting the pulley bearings. On this timber the inspector will naturally stand in performing his duty and the top of the hood for the measurement given would be too high for its comfortable performance. A permanent foot rest for inspection purposes should be built at the receiver for elevators having large-diameter head pulleys. The unsightly appearance of the outside from slimy water cast over the side of the hood may be obviated by nailing on each side of the hood over the center or crest of the discharging stream two horizontal, parallel strips of wood on which to lay two short lengths of board, the strips being sufficiently far apart so that the boards can slide over or under one another.

Elevators Raise Much More Water than Ore

In wet concentrating mills the tonnage of water to be raised in the elevators far exceeds that of ore, the latter often being a mere bagatelle in comparison. In the Cœur d' Alene district the ratio of water to ore entering elevators is unusually high. An idea of this can be gained from the extreme case of the last elevator in the tabulated statement to be found at the beginning of this section. In this case the theoretical horsepower required to raise the water is 10.31 while that for the ore is but 0.84. To keep the size of the elevator in raising ore and water as small as possible it is necessary to have

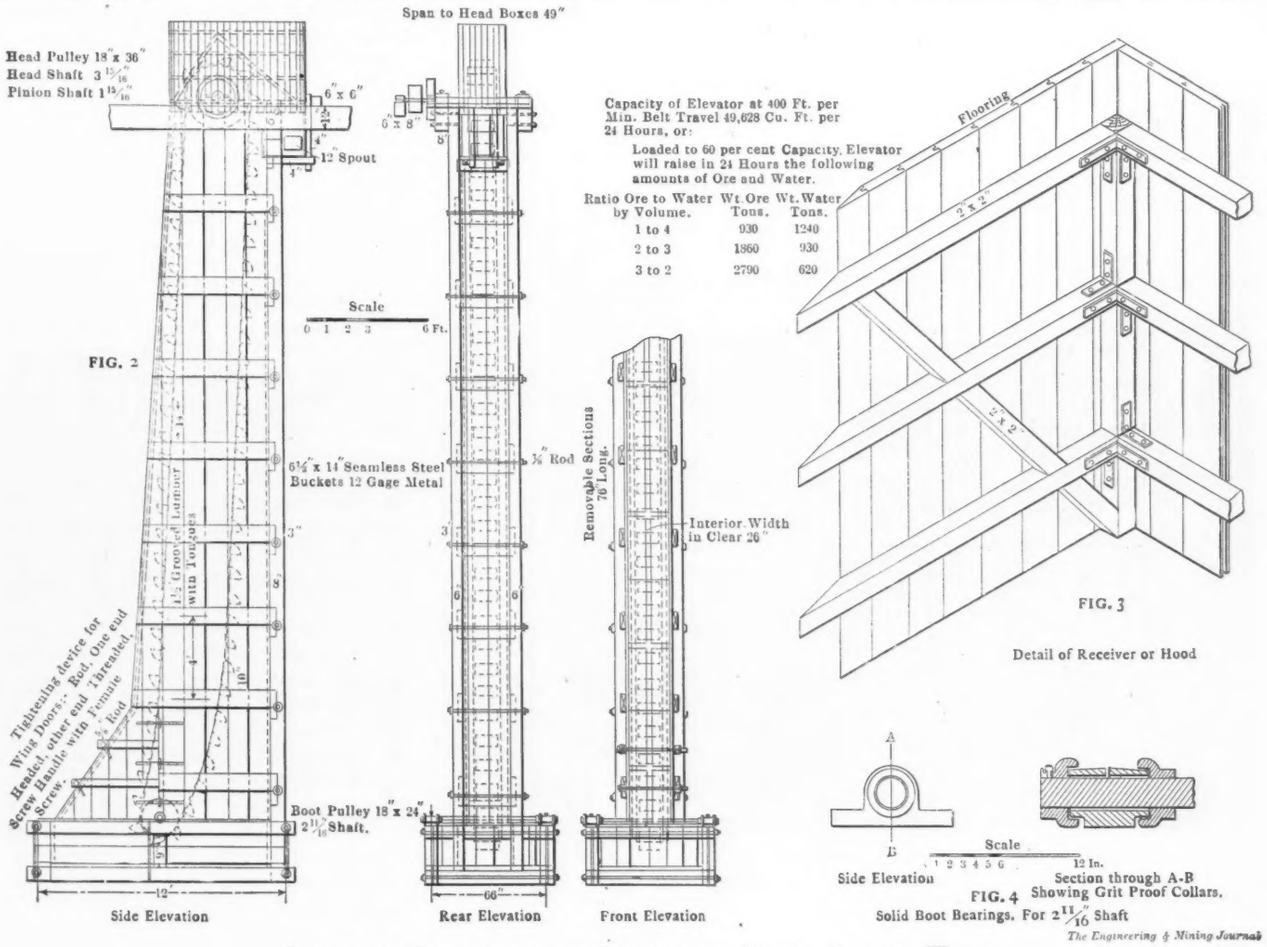

Span to Head Boxes 49"
Head Pulley 18" x 36"
Head Shaft 3 15/16"
Pinion Shaft 1 15/16"
6" x 6"
6" x 8"
12" Spout
Scale
0 1 2 3 6 Ft.
6½" x 14" Seamless Steel Buckets 12 Gage Metal
½" Rod
1¼ Grooved Lumber with Tongues
Tightening device for Wing Doors: Rod, One end Headed, other end Threaded, Screw Handle with Female Screw. ¾" Rod
Boot Pulley 18" x 24" 2 11/16" Shaft.
Removable Sections 76" Long.
Interior Width in Clear 26"
Side Elevation
Rear Elevation
Front Elevation

FIG. 2

Capacity of Elevator at 400 Ft. per Min. Belt Travel 49,628 Cu. Ft. per 24 Hours, or:

Loaded to 60 per cent Capacity. Elevator will raise in 24 Hours the following amounts of Ore and Water.

Ratio Ore to Water by Volume.	Wt. Ore Tons.	Wt. Water Tons.
1 to 4	930	1240
2 to 3	1860	930
3 to 2	2790	620

FIG. 3

Detail of Receiver or Hood

FIG. 4

Solid Boot Bearings. For 2 11/16" Shaft

The Engineering & Mining Journal

Details of Construction of Elevator for Raising Ore and Water

DATA ON COEUR D'ALENE BUCKET ELEVATORS.

Mill.	No. Elev.	Head Shaft Span C. to C. Boxes, In.	Diam. Head Shaft, In.	Diam. Head Pulley, In.	Width Head Pulley, In.	Belt Travel, Ft. per Min.	Batter Front Casing, In. per Ft.	Belt. Width, In.	Belt. Ply.	Spacing Buckets.	Kind and Size Buckets.	Vert. Ht. C. to C. Pulleys.	Vert. Angle Inclin. Pulley Centers.	Boot Shaft Diam., In.	Boot Shaft Span, Ft.	Diam. Boot Pulley, In.	Width Face, In.	Receiver, In. Below C Head Pulley.	Dimension Receiver, In. (Inside).	Dimension Boot, In. (Inside).	Tons Ore, 24 Hr.	Tons Water, 24 Hr.	Range Size Material.	Center Head Pulley to Top Hood, In.
Mammoth	1	47	3 1/2	48	16	440		14	8	18	7x12AA	33'5 3/4"	11°24'	2 1/8	6 1/4	24	16 3/4	25	28 1/4 l. x 24 w. 13 d.		675	800	11"—0"	
Mammoth	2																							
Standard	1	42	3 1/8	39	16	460		14	6	16	7x12A	50'11"	11°35'	2 1/8			16	24 1/4	13x22x36					
Standard	2	44	3 1/8	35	16	412		14	8			39'4 1/4"	5°41'	2 1/8				22 1/2	29 l. x 24 w.					
Standard	1		3 1/8	35	16	458		14	6	16	8x12AA	31'5 1/4"	11°36'	3 1/8	6 8	28	14	17	17 1/4x16 1/4		600	601	1 1/4"—0"	47
Standard	2	41 1/4	3 1/8	36	14			14	8	16	7x12AA								14x16					
Morning	1	37 1/4	3 1/8	36	12			14	6	16	7x12AA													
Morning	2	40 1/4	3 1/8	40	16	350		14	8		6x11AA							22 1/2						
Hunter	1	36'-0	3 1/8	40	14	350		12			6x11AA							21 1/4						
Hunter	2		3 1/8	40	16	400		14	10	14	6x12AA	38'10"	5°53'					27 1/2						
Hercules	3	45	2 1/8	40	12			10		16	riveted steel													
Hercules	1	27 1/2									8x15A	48'												
B. H. & L.	2	45 3/4	3 1/8	37	18	485	1	16	8	18 3/4														
B. H. & L.	3		3 1/8	30			0																	
B. H. & L.	4	47	3 1/8	40			0					43'0"	3°20'	3 1/8				26 1/2						
B. H. & S.	5	47 1/2	3 1/8																					
Last Chance	1		3 1/8	40	18	440		16	8	16	8x14AA	47'85'	8°20'	3 1/8		30	18		46x28 1/2		700			55
Last Chance	2		3 1/8	40	18	440		16	8	16	7x14 steel	42'77	11°6'	3 1/8		30	18		51x21		100	601	1 1/4"—0"	
Last Chance	3		3 1/8	40	18	440		16	8	16	8x14AA	31'67	5°7'	3 1/8		36	18				350	2,405	4—0 m.m.	
Last Chance	4		4 1/8	48	22	500		20	10	20	8x18AA	56'92	7°34'	3 1/8		40	22		50x28 1/2		350	4,305	40—0 m.m.	39

as high belt travel as is permissible. There seems to be in existence an absurd rule of 300 ft. per min., regardless of the diameter of the head pulley, which receives acceptance whether dry ore or ore and water is being raised. As a matter of fact the employment of this rule in elevating ore and water with head pulleys greater than 36 in. in diameter would lead to failure and it would not be entirely satisfactory for this size pulley. On a number of occasions when increasing the speed of elevators I have been warned that the course I was pursuing would lead to disaster. These warnings have generally been accompanied by vague statements that the centrifugal force would carry the ore around the head pulley and back into the boot. Where did such a rule and conception originate? Possibly in seeing sticky material carried over the head pulley and back into the boot (an elevator is not the proper contrivance for raising material of this kind). Possibly from experience gained with head pulleys of small or medium diameter.

SPEED OF ELEVATORS

The rule I use for determining the proper belt speed for raising ore and water which discharges freely from the elevator buckets is: The diameter of the head pulley in feet times 100 plus 100. For pulleys of various diameters the belt travel in feet per minute is as folows: 24-in., 300 ft.; 30-in., 350; 36-in., 400; 42-in., 450; 48-in., 500. In an accompanying diagram, Fig. 5, are shown four curves. Curve *A* is the path taken by a particle in moving outward from the crown of the pulley in the simplest form of elevator bucket, a vane attached at right angles to the belt. In curve *A* the downward effect of gravity is not taken into account. In curve *B* the path of the particle is shown where both the effect of central forces and gravitation are measured. Curves *A* and *B* are drawn to scale for a pulley 36 in. in diameter and a belt speed of 400 ft. per min. Curves *C* and *D* are a similar pair of curves for a pulley 48 in. in diameter and a belt travel of 500 ft. per min. All the curves are drawn about the center of the pulley as origin. The expression from which curves *A* and *C* were plotted contained no factor or member involving in any way the belt travel. In other words the effect of gravitation and friction being neglected, the path of a particle would remain the same for a pulley of any given radius regardless of the speed of the belt.

It will readily be seen, all retarding factors considered, that as the belt travel increases the path of the particles approach the limiting positions of curves *A* and *C*. The retarding effect of gravity would increase with time. The retarding effect due to friction between the particle and the vane I have not considered in an elementary analysis of this

kind. It will be evident that the resistance to sliding of the particle will diminish as the vane rotates, being a maximum when it is in the zero position and nothing when in the 90 deg. position.

A bucket filled with ore and water exhibits different retardation phenomena than does the single particle and vane under discussion. For example the frictional resistance to the rise of the water in the bucket will be much less than to the ore particles and the water will be cast higher and farther into the receiver than the ore. There will be a gradation in the discharging streams from water and sand at the far end of the receiver to coarser ore and water at the bucket end. Dry ore will drop into a receiver in a more condensed mass than when mixed with water. If the receiver be too short in elevating ore and water the end will be unduly worn. After the particles shown in the diagram leave the edge of the vane or bucket they will describe parabolas, the angle of projection being the tangent to the curve at the point of emergence of the particle from the vane. The resultant velocity at this change in curvature will be nearly directly proportional to the belt travel. It must be evident that the effect of increasing the travel of the belt is to cause the particle to rise higher and land farther from the buckets in the receiver. As the diameter of the head pulley is increased the belt travel must necessarily be made greater because the particle has a greater distance to pass in reaching the receiver. The rule for belt speed which I give satisfies this condition in a rule-of-thumb way. It can be safely exceeded if desired. As the belt travel is increased the hood must be made higher and the length of the receiver increased. To some extent these considerations limit the belt travel. But where great capacity is desired it is better to err on the side of high belt travel.

In elevating dry ore a high belt travel is unnecessary and an undue amount of dust would be created by its use. With ordinary size pulleys 200 to 300 per min. belt travel is sufficient. With these low belt speeds the discharge is partly or altogether effected by the ore falling out of the bucket as it nears the receiver. In elevating dry ore the edge of the receiver is placed lower than in ones elevating ore and water and as the receiver is but an enlargement of a spout placed at a high angle little head room is lost.

If the vane shown in the diagram were inclined upward or toward the crown of the pulley the path of the particle would be flattened and the angle of projection and the resultant velocity on emergence from the vane lessened. In general it may be stated that the more open the bucket the better the discharge, a shallow bucket, however, has little capacity. The vane in the diagram has no practical capacity. On acount of these considerations the problem of determining the best cross-section or curvature of the front of the bucket cannot be solved.

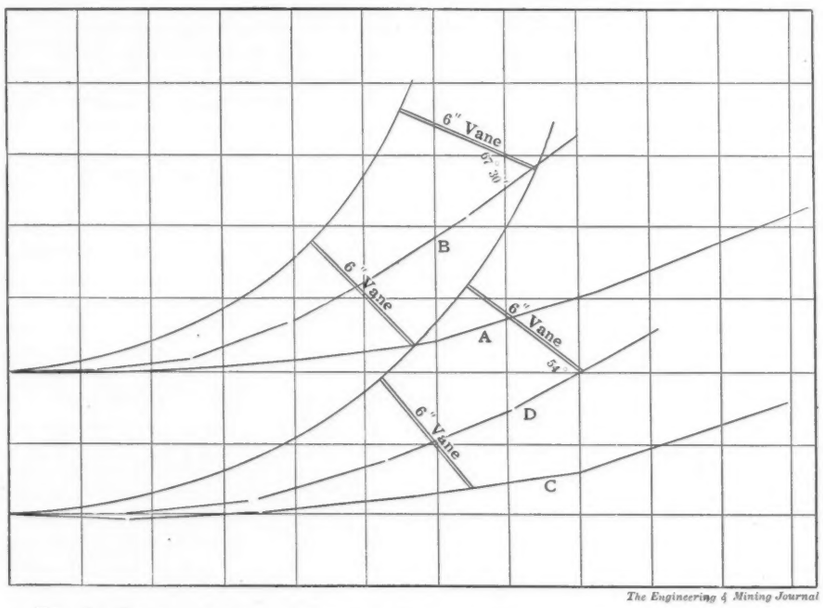


FIG. 5. CURVES SHOWING PATH OF PARTICLE MOVING FROM CROWN PULLEY OF ELEVATOR

DIMENSIONS OF RECEIVER VARY WITH DIAMETER OF HEAD PULLEY

If the rule for belt travel be followed the upper edge of the receiver iron should touch a horizontal line tangential to the lowest point of the crown of the head pulley. The buckets should just clear the receiver iron. These directions are entirely empirical. The most important factors in determining the position of the receiver iron appear to be the diameter of the head pulley and the belt travel. A length of receiver equal to two-thirds the diameter of the head pulley will be found sufficient for ordinary conditions. The lower edge of the receiver spout should be raised from 3 to 9 in. above the bottom of the receiver so as to allow ore to accumulate to protect the bottom of the receiver from wear. It is a good plan to suspend a piece of sheet iron from the top of the hood at the far end of the receiver to prevent undue wear at that point.

The width of the receiver will, of course, be the interior width of the housing proper. This should be made as small as possible to give a minimum unsupported span of the head-pulley shaft. If the head pulley has a clearance equal to a quarter the width of its face the interior of the housing will be found sufficiently wide for conveniently making repairs. With a 16x36 head pulley the interior width of the housing and receiver following this direction would be 24 in. If the unsupported span of the head shaft be too great considerable difficulty will be encountered from its springing and rupturing in the hub of the head pulley or of the latter becoming loose on the shaft. In the design of the elevator accompanying this section the dimension of the boxes of the

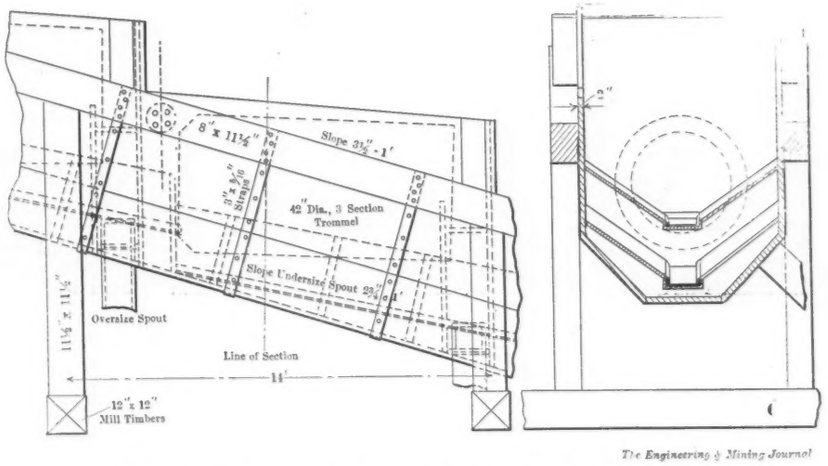


FIG. 6. HOUSING OF TROMMELS IN COEUR D'ALENE MILLS

head pulley is 49 in. center to center. The face of the head pulley is 16 in. and the housing is built of 1½-in. tongue-and-groove lumber. The exterior width of the housing is 29 in. The front vertical timbers are 6 in. and the bridge trees 8 in. wide. This makes the dimension of bridge trees as above, 49 in. center to center. In the second column of the accompanying table will be found figures showing the dimension from center to center of the head pulley boxes of Cœur d' Alene elevators.

Head Pulley Shafts Should Be of Larger Diameter

On the score of extra stiffness head pulley shafts should be of greater diameter than those to be seen in the Cœur d' Alene mills. For an elevator of from 50 to 60 ft. vertical lift, 20x48 head pulley, 8x18 A A maleable-iron buckets loaded to 60 per cent. of their capacity, and an 18-in. 10-ply belt, a 4 15/16-in. shaft is required if it be provided with a keyway. If the pulley is hydraulically forced on the shaft the hub being reinforced by shrunk-on bands, which is the better practice, the diameter may be reduced to 4 3/16 in. For an elevator of 20 ft. vertical lift, 14x30 head pulley, light steel buckets and 12-in. 6-ply belt the head shaft need not be of greater diameter than 2 11/16 in. For geared elevators a pinion shaft of 1 15/16 in. diameter will be found of ample size for moderate lifts. For heavy duty the diameter of the pinion shaft should be increased to 2 7/16 in. These recommendations are dependent upon the ratio of teeth in the gear wheel and pinion being not less than four to one.

An inspection of the table will show that the batter of the front of the housing varies from 0 to 1¾ in. per ft. The tendency of late years has been to make the back of the housing vertical, it being found that wear at this point increases with the slope. In the elevator design shown it will be noted that as a further precaution against grit cutting the back of the housing the receiver extends into the housing. To maintain the contact of the belt with the boot pulley the universal practice in the region is to advance the head pulley in the direction of the receiver and away from a vertical line carried upward from the center of the boot pulley. As the belt stretches there is merely a shifting of the position of the arc of contact with the boot pulley.

In column 14 will be found values for the angle made with the vertical by a line passing through the centers of the elevator pulleys. If the center of the head pulley be advanced from the center vertical line of the boot pulley a distance equal to the diameter of the former a satisfactory and automatic taking up of the slack is obtained. Following this direction, the vertical angle made by the line passing through the pulley centers is, for an elevator of 60 ft. vertical lift, about 3 deg. 49 min. If the lift be but 20 ft. the angle becomes about 11 deg. 18 min. As the lift increases the weight of belting also increases and a lesser inclination is sufficient to make the belt warp and cling to the boot pulley.

Size of Boot Pulley

A pulley of approximately two-thirds the diameter of the head pulley will be found satisfactory for service in the boot. If the elevator is fed from the side the boot pulley should be provided with an extra-thick rim and the arms made extra heavy where they merge into the rim. A light shaft will answer for the boot pulley as there is but little stress upon it. Take-up boxes on an elevator raising ore and water are an abomination; there is no practical system of taking care of the slack of the belt but by inclining it. I prefer this method for elevating dry ore.

Fig. 7. Last Chance Mill, Coeur d'Alene Mining Region, Idaho

In the matter of boot bearings attention is invited to the solid bearings with enwrapping collars shown in Fig. 4. It is well nigh impossible to keep the cap of two-piece boot bearings in place; also with this style of bearing and plain collars openings are exposed for the entry of grit. Sufficient grease should be forced into the bearing shown in the drawing to insure that it will ooze out between the end of the bearing and the collar and completely close the bearing. The boot bearings are always cold and no difficulty is experienced in keeping the grease coagulated.

The boot is always made wider than the housing proper when elevating ore and water. An interior width of 2¼

times that of the housing proper will be found ample for the boot. The length of the boot will be dependent upon the slope of the back end of the housing and if the elevator be side fed upon the number and size of the spouts entering the boot. In the drawings shown the back end of the housing is vertical and the interior length ahead of the center of the boot pulley is the diameter of the head pulley plus the overhang of the receiver, the thickness of the belt, the width of a bucket and the clearance of the bucket with the receiver iron, or a total of 5 ft. 3 in. The length in front of the center of the boot pulley is the same.

Proper Speed Important

I found one elevator in the district which had a spray pipe in the receiver for the purpose of loosening the ore in the buckets. This elevator raised fine material mixed with a comparatively small amount of water to a considerable hight. While being elevated the fine ore settled and packed in the bucket. I have encountered this difficulty on a number of occasions, especially when raising fine concentrates through even a moderate hight. Two cures can be practised, one the spray mentioned, the other, boring tiny holes in the bottom of the bucket; this will cause water to work down through the mass of ore and keep the grains apart. The spray is the more effective method of the two. Packing of ore in the buckets can frequently be cured by increasing the belt speed.

In an overloaded elevator there will be found to be a curious selective action. At the start of operations ore and water in the ratio entering the boot are raised, gradually, however, the quantity of water raised diminishes until finally the buckets arrive at the receiver filled with a packed mass of ore. The explanation of this action, if the belt speed be too low, is that at the start a certain proportion of ore falls back into the boot while the bulk of the water drops into the receiver. Finally the ratio of ore to water in the boot becomes so great that the elevator is overloaded with a mass of sticky coherent ore. An elevator which has insufficient belt speed has a characteristic discharge: The loads of each bucket rise out of them separately and appear to lag behind the bucket from which they came.

In designing elevators a greater load than 60 per cent. of the catalog capacity of the buckets should not be aimed at. Buckets loaded by dipping into the boot will not fill to more than 70 per cent. of the rated capacity.

Little additional explanation is needed to make the accompanying plans of an elevator comprehensible. At the back of the housing are two vertical 6x8 members resting on the sills of the boot and bolted to the bridge trees at the top. Framed into these are 3x10 timbers to which are spiked the boards of the housing. The boards of the housing are entirely supported by these timbers, having no footing in the boot. The front of the housing consists of light sections 76 in. long which are secured by wood screws to strips of wood nailed to the interior of the housing. These can be quickly removed for repairs. Access to the interior for ordinary repairs can be had by throwing back the wing doors at the bottom of the elevator.

Revolving Trommels

The trommel lines in Cœur d' Alene mills are invariably placed at one side of the elevator feeding them. The spouts from the elevator have a generous width, usually 12 to 16 in. The usual slope of these spouts is 3½ in. to 1 ft. To reach the trommel line, the receiving spout of the elevator makes a right-angle turn. The trommel end of the spout is brought as close to the arms of the hood spider as possible.

All of the old mills of the district were provided with trommel lines driven from a single countershaft fixed above them. This countershaft drove by bevel gearing a center trommel, and motion was transmitted to others by means of gearing. This mode of driving is still to be seen in a few places; in others it has been changed to sprocket, or other forms of drive. In the newer mills individual driving of the trommels is practised. In the old mode of driving, each trommel except the lowest was provided with three gear wheels; one at the top, an idler in the center, and a lower gear wheel. The upper gear wheel was keyed to the end of the trommel shaft and the lower gear wheel to the reverse end of the trommel shaft below. The shafts rested in bearings set in slots in the vertical arm of a cast-iron cross. The idler between the gear wheels was supported on a pin inserted in the center of the cross, the latter being supported by bolts passing through the ends of the horizontal arm and the inclined timbers of the trommel line.

The supporting surface for the pin in the cross, on which the idler rotated, was entirely inadequate and in service, the racking movements produced in the idler speedily loosened the nut which held the pin in the cross, and the idler dropped upon the lower gear wheel; also the teeth of the wheels were more worn at the edges than in the centers. Then too the lower gear wheel received the splash from the launder below it, and grit was transmitted from it to the other gear wheels. In making repairs on one trommel it was necessary to turn over the whole trommel line and I have frequently seen a great portion of a mill crew exerting all their strength, on a crowbar placed in the spokes of the drive pulley, vainly endeavoring to turn over a trommel line driven in this way. Why such a wretched piece of design still persists is a mystery to me.

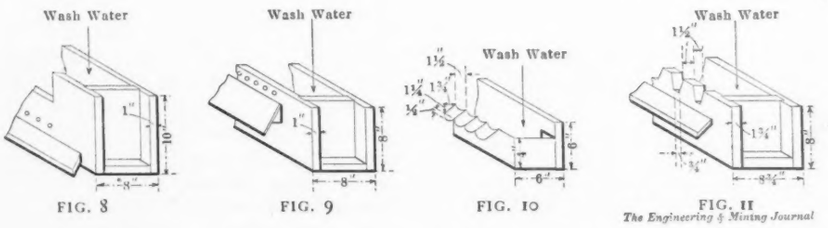


FIG. 8 FIG. 9 FIG. 10 FIG. 11

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Types of Water-feed Boxes in Coeur d'Alene Mills

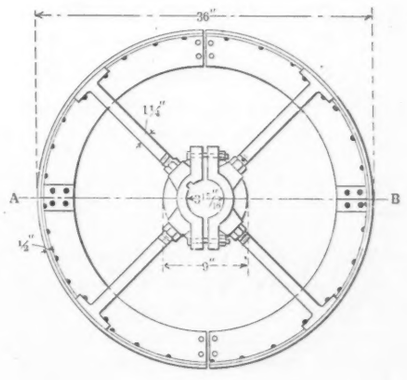
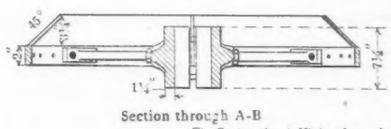


FIG. 12



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Split Spider used in Coeur d'Alene Mills

Trommels Should Be Separately Driven

The best system of driving trommels is to have a belt for each trommel, motion being transmitted by a bevel pinion. If there is a double trommel line, two trommels can be driven by one belt. In some places outside the Cœur d' Alene, trommels have been successfully driven by direct belting from a slowly revolving countershaft. In the Cœur d' Alene mills where sprocket drives are empoyed, the drive shafts are placed horizontally and in the plane of the long

axis of the trommel line. An inclined drive shaft would entail complications of support. The chains in this mode of driving are very long for the lower trommels.

In individual driving with bevel-gear wheels and pinions, the pinion shaft can either be provided with tight and loose pulleys, or the pinion can be made to slide over a fixed key by means of a lever; the key and key-way must then be kept well slushed with grease. If the sliding pinion device be employed the trommel can always be disconnected from the drive shaft while with a tight and loose pulley, if the mill shuts down suddenly, the belt must be thrown before the

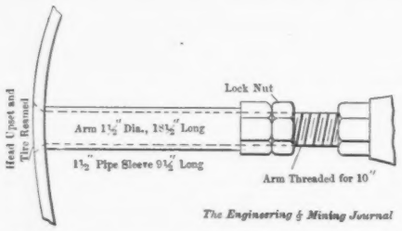
Head Upset and Tire Reamed
Lock Nut
Arm 1½" Dia., 18½" Long
1½" Pipe Sleeve 9¼" Long
Arm Threaded for 10"
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FIG. 13. SPIDER ARM WITH PROTECTIVE PIPE SLEEVE

trommel can be turned around freely by hand.

WOODEN HOUSING FOR TROMMELS

A riveted steel housing is a nuisance. It is bound to wear through sooner or later anyhow and, if made of wood, a temporary patch can be quickly applied and a neat permanent repair made when the mill is shut down for general repairs, while with a steel housing the temporary cure is a wad of waste and the permanent repair requires a blacksmith, repair plate and rivets. Not all mill blacksmiths understand boiler making.

The usual type of housing employed is shown in Fig. 6. The drawings also illustrate the mode of connecting the trommel timbers with the mill framing. The slope of the undersize spouts varies from 2½ to 4 in. to 1 ft. The slope of the bottom boards and supporting timbers is usually 3½ in. to 1 ft., and in one extreme case 5¼ in. to 1 ft. The housing, as indicated in the drawing, is one long continuous trough supported from inclined timbers. The method of supporting the housing shown is excellent. The boards are bolted to iron straps, shown in section, and these are in turn bolted to the inner sides of the sloping timbers. The only criticism that can be made of this style of housing is that the sides rise too high. This is another of the baneful effects of the cast-iron cross device. To support the cross the inclined timbers must be high, and the housing depend from these timbers. With the single drives the housing could be placed lower and high removable side boards provided to prevent splash. When the trommel is being repaired the side boards could be removed and a greater portion of the trommel thus be exposed. A greater width of housing than at present prevails in the district would also facilitate repairs.

WATER BOXES FOR TROMMELS

With very few exceptions all the mills are bothered by dirty water for which neighboring mills higher up stream are responsible. There is usually an excessive amount of dirt and trash in the wash water and even in the clearest water to be obtained in the district, there is a large amount of iron salts, which, when exposed to the air, precipitate hydrated iron oxide in the form of a reddish slime or ooze. If spray pipes were employed on the trommels, as is the practice in many camps, the comparatively small holes would speedily become clogged with iron. The use of spray pipes being out of the question, water boxes are consequently exclusively employed. The usual types are shown in an accompanying illustration. All these boxes after being put into service quickly fill up to the outlets with slime and dirt. That shown in Fig. 8 is the poorest of all. The far holes quickly fill up with muck and only those holes at the end where the wash water enters remain open. It will be noticed that the box is cut out above

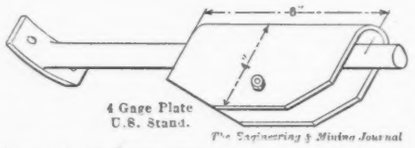

FIG. 14. DEVICE FOR PROTECTING SPIDER ARM

the spray holes as a safety measure, but even with this precaution the water has a tendency to issue at the end where the wash water enters. The box of Fig. 9 is open to the same objection, the only advantage being that after the box is cleaned out a little more time will intervene before it is necessary to repeat this operation. Fig. 10 is the best of all the types shown. This box, while it fills up with trash and slime, always remains open from one end to the other, back of the curved surfaces secured to the front. With the exception of the back this box is made of steel. The curved spouts are made separate and soldered to one another and to the steel box. Each curved blade has a flange at one side to assist in soldering to its neighbor. This is not shown in the drawing.

When repairs are being made care should be taken to see that the water box is set back on its brackets in a perfectly level position. All forms of water boxes should be either provided with apron or projecting spout, as otherwise the water passes by capillary action, or falls, into the undersize in an irregular mass. In a number of mills I observed water boxes from which the apron had been broken, and all the water was passing into the undersize.

A spray or box on the outside of a trommel is a very ineffective device. From observation in the Cœur d' Alene, and elsewhere, I am of the opinion that not more than 10 per cent. of the wash water enters the trommels, and does effective work, the remaining 90 per cent. serving only to dilute the pulp. Just as long as mill men are content with trommels consisting of spiders, shaft and plate this trouble will continue. A spiderless trommel would allow of a spray being used inside where it would do the most good.

SPLIT SPIDERS IN GENERAL USE

The size of shafts used for trommels range from 2 15/16 to 3 11/16 in. in diameter. The latter shaft would be ample for a trommel of say zero gage plate (U. S. standard) and four sections each 30 in. long; the former for a two-section trommel of the lightest plate. Of late years the split spider and hood have come into general use and I am under the impression that this form of spider originated in the district. Fig. 12 illustrates a split spider and hood. The built-up steel hoods are more durable, cheaper, and lighter than cast-iron ones. The advantage of the split spider is manifest. If a solid-hub spider becomes loose on the shaft, there is nothing to prevent it from shifting uneasily on the key, and eventually sliding clear of it. Once loose, grit will lodge between the hub and the shaft and wear will increase rapidly.

The center spiders are most likely to become loose, and if the hubs are solid all the others must be driven off the shaft before the loose one can be removed. Solid spiders either loosen on the shaft, or else become so firmly rusted in place that all efforts to dislodge them are frequently ineffectual. The procedure in the case of a solid-shaft spider which has become loose is to treat the shaft with sand paper, and kerosene, accompanied by intervals of sledging the hubs ahead of it which must be removed. Pieces of giant powder are occasionally resorted to to start refractory keys and frequently the hubs have to be broken off with charges of powder.

When the spokes of the spider shown are worn through near the tire, the spider is sent to the blacksmith's shop and new spokes welded to the cross pieces secured to the tire. Fig. 13 shows a spider arm used in Mexico which allows for worn arms and the protecting covering being removed and replaced by new ones without removing the hub from the shaft. Fig. 14 shows a protective piece for the spider arms, in general use on the hood spiders in the Cœur d' Alene. Figs. 15, 16, 17, 18 and 19 show various forms of trommel-band lugs. The designs shown in Figs. 15 and 18 have the same size openings from one end of the

lug to the other. The rest have tapering holes. Fig. 17 shows the best form of lug. The holes are tapering, and the lugs being short they lie flat on the trommel. The lug is made of steel and has to be finished by the blacksmith in a mold made for the purpose.

In putting on new trommel plate logging chains are used. The chain is placed around the trommel plate, and after the hook is caught in some convenient link, the plate can be drawn up by slipping a bar under the chain and twisting it. Patches are put on with elevator bolts, and are cut from old pieces of trommel plate. The band patch, entirely encircling the trommel, is used in some of the mills, and is quickly applied—owing to the small slope of the trommels the wear of the plate occurs in peripheral streaks.

ing the length of the trommel must be increased. If mill men were provided with trommels the slope of which could be altered at will, and while the machine was running, I am confident that the slopes would be materially increased.

The limits of the trommel sizing are 2½ mm. minimum, and 36 mm. maximum. The usual practice is to break, then crush in No. 1 rolls to a limiting size of 1 to 1¼ in. and elevate the crushed material to a trommel line with maximum size of holes from 34 to 36 mm. in diameter, the oversize from this latter screen being returned to the rolls for further crushing. In some of the old mills this oversize passed directly to bull jigs, and the middlings from these to rolls. The first practice is, of course, the better. The usual diameters of the trommels used

the percentage of finished product, or product which will pass the trommel, diminishes with the decrease in the size material fed to the rolls, and with the decrease of the set of the rolls. With fine middlings, therefore, and with such a circuit, the burden returning to the trommel increases by leaps and bounds. I have seen a case of this kind where, with an original tonnage of about 200 tons fed to the mill, the stream of material flowing to a trommel at one point was at the rate of 900 tons per day. As Richards has pointed out, the circulation of middlings in the way mentioned above produces great blinding of the trommels, because there are a large number of grains of ore of very nearly the diameter of the plate openings. Blinding in the trommels with small openings is more

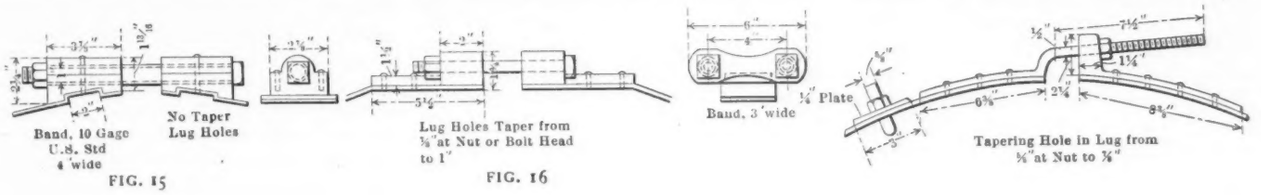
Band, 10 Gage U.S. Std 4" wide
No Taper Lug Holes
Lug Holes Taper from ⅜" at Nut or Bolt Head to 1"
Band, 3" wide
¼" Plate
Tapering Hole in Lug from ⅝" at Nut to ⅜"

FIG. 15 FIG. 16

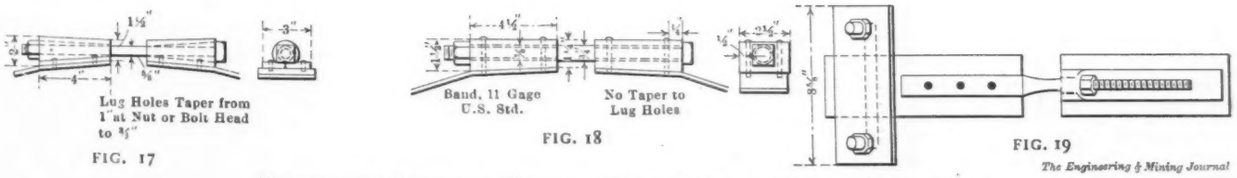

FIG. 17 FIG. 18 FIG. 19

METHODS OF FASTENING TROMMEL PLATE BANDS IN COEUR D'ALENE MILLS

It is secured by a bolt passing through two lugs riveted to the ends.

TROMMELS GIVEN INSUFFICIENT SLOPE

The slope of the trommels in this district varies from ⅜ to 1⅛ in. to the foot. In most of the mills all the trommels were originally given the same slope, but owing to wear of the boxes and other causes, considerable variations are to be noticed. In a few of the mills a descending scale is employed, of which the following figures will furnish an example: Trommel No. 1, 11/16 in. to 1 ft., gage of plate, 6 U. S. standard, 15-mm. round holes; No. 2, ¾ in. to 1 ft. 8-gage plate with 10-mm. holes; No. 3, 13/16 in. to 1 ft., 12-gage plate with 7-mm. holes; No. 4, ⅞-in. to 1 ft., 12-gage plate with 4-mm. holes; No. 5, ⅞-in. to 1 ft., 16-gage plate with 2½-mm. holes. Approximately 600 tons per 24 hours enters the head of this trommel line.

In the matter of slope, I am heartily in accord with Richards' recommendation of 2 in. or more to 1 ft. It is almost impossible to make mill men see the force of Richards' arguments for increasing the slope over the practice which now prevails. The almost invariable, scornful dictum given in response to such suggestions is that to improve the screen-

are 36, 42 and 48 in. The 36-in. size is only used for screening fine jig middlings.

TROMMELS OVER BURDENED

A single trommel line, 42 or 48 in. in diameter, receives during 24 hours at its head end from 150 to 500 tons of direct feed, and, in addition, from 75 to 300 tons of coarse middlings. For mills with any capacity up to 500 tons per day a single trommel line has usually been provided. In a few larger mills a double line of trommels is provided. With such enormous tonnages as are usual in the Cœur d' Alene passing into the trommel, good screening is not to be expected. Sizing tests showed in extreme cases only 50 per cent. of perfect work; that is to say, the oversize contained 50 per cent. material which properly belonged in the undersize. Screening to a limiting size of 30 to 36 mm., it is my opinion that not more than 250 tons of ore should be fed in 24 hours to a trommel line of from 42 to 48 in. diameter.

These statements do not cover the whole matter of over-burdening the trommels. Frequently large amounts of fine middlings are returned to trommels at the lower end of the line, and the oversize so made passes to jigs, thence to rolls, and back to the same trommels. As pointed out under the head of rolls, difficult to cope with than in trommels with large openings, because the grains rust in the holes very quickly, and unless the screens are constantly beaten out become so firmly lodged that they can only be driven out with a hammer and punch.

If no middlings are returned to the trommel line it will be found that the screening in the fine-hole trommels is no better, if not worse, than in the coarse ones and this despite the fact that the amount of arriving ore has been diminished by the removal of oversizes by the trommels above. In such a case inferior screening cannot be attributed to blinding because there is no reason why there should be a greater amount of grains near the size of the openings in the fine-hole screens than in the coarse ones. This statement will also apply to dry screening. In dry screening some method is usually adopted for keeping the whole screen in vibration. If the ore be bone dry this is unnecessary. With perfectly dry ores I have got good results with ordinary trommels. In one case the screening was so perfect that the water in the jigs was clear.

WASH WATER INEFFECTIVE IN SCREEN SIZING

Little of the wash water used on trommels enters them and does effective

work. What little does enter the trommel runs down the inside and under the bank. If wash water, as at present used on trommels, does any material work in thoroughly loosening the cohesion of the grains, transporting fine undersize grains through the interstitial passages in the bank, in pointing the long diameter of the grains toward the openings in the trommel, or assisting in lubricating the grains in passage through the screen openings, I have failed to note it. When the stream of ore enters the head trommel of the line it loses all the water brought in with it before it has traveled to the end of the first section; also, a greater proportion of the slime and markedly under-size ore. What then remains may be considered a mass of coarse-grained material. With such a high upper limit of screening as prevails in the Cœur d' Alene, there is little coherence in a mass of this kind. The bank tends to rotate as well as advance and grains slide down the bank where momentarily they are in contact with an uncovered portion of the trommel plate. If they fail to pass through the openings they are carried up under the bank ultimately to appear again and go through another cycle.

Trommels Suited for Coarse Sizing

The path of a grain of coarse material in a trommel is a helix. And with the active tumbling about caused by this motion through the trommel, grains arrive at the trommel plate in various axial positions. This is a decided advantage as more opportunities are afforded each particle to pass through the screen openings. The larger the proportion of material very nearly the size of the apertures of a screening apparatus which will pass the holes, the more efficient is the apparatus, and for the reason that, with coarse sizes, the action of the trommel tends to eliminate pieces of very nearly the diameter of opening, its adaptability lies in this class of work. In a flat screen the pieces of ore tend to ride through on their flat sides.

As the feed to the trommels diminishes in size of grain, coherence of the particles increases rapidly. To see the force of this statement one has only to squeeze in his hand some wet sand and notice how it packs. In fine trommels after the elimination of the water the bank tends to swing back and forth in a mass, and screening only takes place where the bank is immediately in contact with the trommel plate. At one time, milling an ore the gangue of which consisted of quartz and a dark trap rock, in the fine trommels, the grains of dark trap rock were noticeable against the white background of the quartz and it was perfectly possible to fix attention on one particular grain of dark ore, and observe its passage through the trommel. Grains on top the bank would frequently ride through without disappearing in the mass below, the paths being long, flat saw teeth.

In dry screening, there is cohesion of the grains, but not to so marked a degree as in wet work. If the whole mass of ore in the screening apparatus is under water the coherence is entirely destroyed, and with proper means perfect screening should be obtained. Everyone is familiar with the ease and rapidity with which hand screening may be accomplished if the screen and its contents are held down in a pan of water. Below 4 mm., because of the effect of coherence, I am of the opinion that a flat screen of some form will give better results than a trommel.

Heavy Plate for Coarse Trommels

The general practice in the Cœur d' Alene is to have the gage of the heavy plates greater than recommended by the manufacturers. On the other hand, the finer sizes conform rather closely to

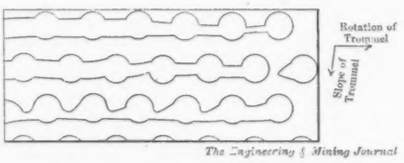

Fig. 20. Wear of Trommel Plates

the manufacturers' recommendations. The ratio of thickness of plate to diameter of hole decreases as the hole becomes smaller. If the holes in trommels be considered as tubes filled with solid streams of material, owing to friction, the discharge will be relatively less with the fine screens than with the coarse ones.

Fig. 20 shows a sketch of the actual wear of a portion of trommel plate. The motions due to rotation and the slope are indicated by arrows. As shown wear starts from the edge of the holes farthest from the ore bank as they rotate. Owing to the small slope of the trommels the tendency of wear, once started at a point is in a circular line, the planes of which are almost at right angles to the axis of the trommel. Ultimately if wear is allowed to proceed the trommel plate is cut into circular sections. If the slope of the trommel were greater the wear would be more uniformly distributed.

The design of a spiderless trommel so arranged that the slope could be altered while the machine was running should not offer any serious difficulties. Such a trommel would be supported, of course, by friction rollers, and means would have to be taken to protect the rolling surfaces against grit. A trommel line provided with such revolving screens could have an overhead crawl to remove the trommels needing repairs, the removal and substitution of a new one being a matter of a few moments. The other advantages are manifest. The traveling belt screen is the only other form of screening apparatus to be seen in the Cœur d' Alene. The Callow screen is largely used in retreating middlings and tailings and has given excellent service.

Pocket Edition of Geologic Folios

The U. S. Geological Survey has just adopted an octavo field or "pocket" edition for its geologic folio publications. The results of the detailed geologic surveys necessary to the preparation of the geologic map of the United States have heretofore been published by the survey in folio form, 168 such folios having been already printed. Each folio contains the topographic base map of the quadrangle under consideration and maps showing the areal and structural geology, while in some folios are maps showing the economic geology and in others the underground water resources of the region. The map sheets are about 18x21 in. and are accompanied by brief descriptive texts printed on sheets of corresponding size, making the folios extremely cumbersome for field use.

While the folio form has given general satisfaction for office and library use, it has been recognized for some time that a more convenient and if possible a "pocket" edition would add greatly to the value of the publication for field work. It has therefore been determined to continue the folio form of this publication and also to print a field edition in octavo size—about 6x9 in.—in which the maps are folded and inclosed in a pocket.

The folios in the new form can easily be preserved on ordinary shelves with other books. Five folios in this form have been printed by the survey and are now ready for distribution, namely, the Belle Fourche (S. D.), the Aberdeen-Redfield (S. D.), the El Paso (Tex.), the Trenton (N. J.), and the Jamestown-Tower (N. D.), numbered respectively 164, 165, 166, 167 and 168. They are bound in substantial covers provided with pockets that hold securely the accompanying maps. The maps are printed on a special paper that will bear refolding and handling and the books will slip into a good-sized coat pocket.

The price of the folios of the field edition is the same as that of the library edition, 25c. each—the cost of paper and printing. Another slight departure in connection with the publication of the geological atlas, beginning with the above five numbers, is the printing of separate maps (unfolded) showing the areal geology of the quadrangle. These can be obtained for five cents each so that those who desire geologic wall maps can procure them at nominal cost.

The Geological and Physical Condition of Tonopah Mines

By Walter P. Jenney*

A cluster of low volcanic peaks mark the site of the mining camp of Tonopah. It has in the past been an area of concentrated volcanic activity; of repeated eruptions and outpourings of lava, one succeeding another, beginning in the early Tertiary and continuing until comparatively recent geologic time. With the dying out of the eruptive phase of volcanic activity, there followed a period of intense dynamic action; of fissuring and faulting of strata, accompanied by the formation of deposits of gold and silver ore. So recent has been the cessation of volcanic outbursts in this district that the rocks, like the eruptive formations of the Comstock, still retain a portion of their original heat. Notwithstanding the comparatively late deposition of the ore, there are evidences in the mines that the formation of the deposits extended over a long period, with many disturbances and interruptions.

An Area of Igneous Rock

Tonopah conforms to the general law of areal distribution of mining districts, namely, that "ore deposits have been formed only in local areas of disturbance and faulting and in direct association with eruptions of the igneous rocks." So intense and concentrated has been the formation of the ore in this basin among the volcanic hills that the deposits are of a richness and size seldom equaled.

Examined more particularly, it is seen that the rocks of the district are all of igneous origin; the successive eruptions of lava, of varying composition, having been outpoured from a number of volcanic vents, in sheets superimposed one upon another. In places the structure is not so simple, and the successive flow sheets of lava are broken through by later intrusions of volcanic rock. Further, the strata, after the sheets were laid down, have been extensively faulted.

Of the many igneous formations in this area, it is only necessary to describe those which directly influence the occurrence of ore. These, in the order of their eruption, are the earlier andesite, the later andesite and the rhyolite. The earlier andesite is white or light gray in color, soft, breaking with a rough fracture; the later andesite is darker in color, weathering near the surface with a deep brown or purple tint, so that it is usually readily distinguished from the earlier andesite; the rhyolite is largely composed of quartz, breaks with a fine-grained, splintery fracture, and is commonly light greenish-gray in color. The general dip of the andesites is to the north, at angles usually from 15 to 45 deg.; the rhyolite sheet, being intrusive in the older lavas, often does not conform to this dip, and in some areas is nearly horizontal.

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The Earlier Andesite

It is, however, when the ore-bearing character of these different rocks is considered, that this distinction between the several flows becomes important. The earlier andesite is the great ore-bearing formation of the district, and for this reason is called by the miners the "lode porphyry;" the rhyolite in places carries workable deposits of ore, while the later andesite, known as "cap rock," is usually barren. Owing to causes which it is not necessary to here discuss, the veins are larger and more regular where traversing the earlier andesite, and often contract in width, or pinch out altogether on entering the rhyolite. In some instances, however, the veins pass from the lode porphyry into the rhyolite without material change in the breadth or richness of the ore.

The favorable nature of the earlier andesite as a wall rock is shown by the production; more than 90 per cent. of the ore extracted from the mines of Tonopah has been stoped from veins in that formation. In this the ore deposits conform to the general law of a selective deposition, namely, that "some geological formations appear to be everywhere barren of ore; others occasionally carry small deposits, workable where the conditions are exceptionally favorable; but in each mining region certain strata are ore bearing in a degree exceeding all other formations combined."[1]

The earlier andesite appears at the surface in a limited area, in ground owned by the Midway and by the Tonopah Mining Company, where it extends to a depth of 500 to 600 ft.; elsewhere it is capped by the dark-colored later andesite, or by flows of rhyolite. Beneath these capping formations, the earlier andesite has a much greater areal extension and stretches east and west in a broad belt, extending from the Belmont mine, at the extreme east of the district, to the Tonopah Extension and Golden Anchor mines on the west, a distance, as now explored, of nearly a mile. In the Tonopah and Midway workings, the belt is developed over a breadth of 1000 feet.

The Rhyolite

In prospecting the Tonopah mines, the problem is largely the exploration of the lode porphyry, or earlier andesite. All the ore deposits known in the district are subsequent in formation to the intrusion of the youngest rock in the series, the rhyolite. In following the veins to the deep, certain places are found where conditions have been such that the ore departs from the earlier andesite and cuts through the underlying rhyolite; or, in other words, in particular places, the highly heated waters and vapors that deposited the ore have broken through the sheet of rhyolite in their upflow from the depths, and have penetrated and laid down the ore in the earlier andesite resting upon it. In their ascent toward the surface, the veins usually terminate on reaching the cap rock; from this cause, many of the productive veins are blind and do not appear at the surface. Only in the area mentioned, on the Tonopah and Midway properties, where the earlier andesite flow covers the surface, do the veins outcrop in pay ore. Other orebodies spring from the contact of the rhyolite with the earlier andesite (which forms the footwall or south boundary of the lode porphyry belt), and extend upward in the andesite. In the West End and MacNamara mines, sheet deposits of high-grade ore occur on this contact. Some of the larger veins when followed on the dip go down in a series of flats and pitches (like a flight of giant steps), in which the horizontal travel of the vein to the north is greater than the vertical descent on the normal dip. This is the result of faulting, and tends to carry the ore-bearing fissures, in their descent to the deep, toward the north side of the earlier andesite belt.

There remains to describe a peculiar, early formed, fault fissure filled with volcanic mud and which cuts through all the igneous flows and outcrops at the surface, from the Belmont mine west to beyond the Midway. It is known as the Mizpah dike (or fault), and while in itself not ore-bearing, has influenced the deposition of the orebodies along its course. In the deeper levels of the mines there are evidences that the ascending waters, which formed the ore, in some instances came up through fissures and channels alongside the dike.

Closely Spaced Fissure Veins

The ore formation may be described as a broad belt of fissure veins, often closely spaced, traversing the district in a general east and west course. The extent of this mineral belt is undetermined; continuous stopes and connected levels reach from the Belmont mine, westerly through the Tonopah, Jim Butler, Montana, Midway, MacNamara, West End and Tonopah Extension mines. The Belmont is following the ore easterly beneath Mount Oddie; the Tonopah Extension is exploring the belt to the west toward the McKane property, and in depth to the north, in the direction of the Golden Anchor. With present development, ore deposits are opened along the course of the belt for nearly a mile, and are distributed over a breadth, north and south, of 3000 ft. The veins vary widely in width and often subdivide into branch veins, which not infrequently equal in size the original fis-

[1] "The Chemistry of Ore Deposition," by Walter P. Jenney. *Trans.* A. I. M. E., Vol. 33, p. 473.

sure. The great output of the camp is drawn from stopes averaging 4 to 5 ft. in width; where the ore is high grade, even the smaller veins are worked at a profit. In the Belmont, Tonopah and Tonopah Extension mines, some of the fissures are of great size, with orebodies 15 to 35 ft. in breadth, measured at right angles to the walls.

The ores are largely quartz, carrying silver glance (argentite), ruby silver (pyrargyrite), and the so-called "brittle silver" (polybasite, etc.), together with chalcopyrite and other sulphides bearing gold and silver. The ratio of silver to gold in the ores is quite uniform throughout the district, being 90 to 100 oz. of silver to one ounce of gold; in the bullion produced, about one-third the value is gold. The grade of the ore as sent to the mills ranges in assay value from $12 to $50 per ton.

The Tonopah ores resemble in mineral character and in the ratio of gold to silver the ores of the Comstock. It is also noteworthy that in certain mines, particularly the West End, the ore deposits occur largely in the country rock, exterior to the fissures through which they were formed—in places reaching out 50 ft. or more beyond the fissure walls, a type of deposit characteristic of the Comstock lode.

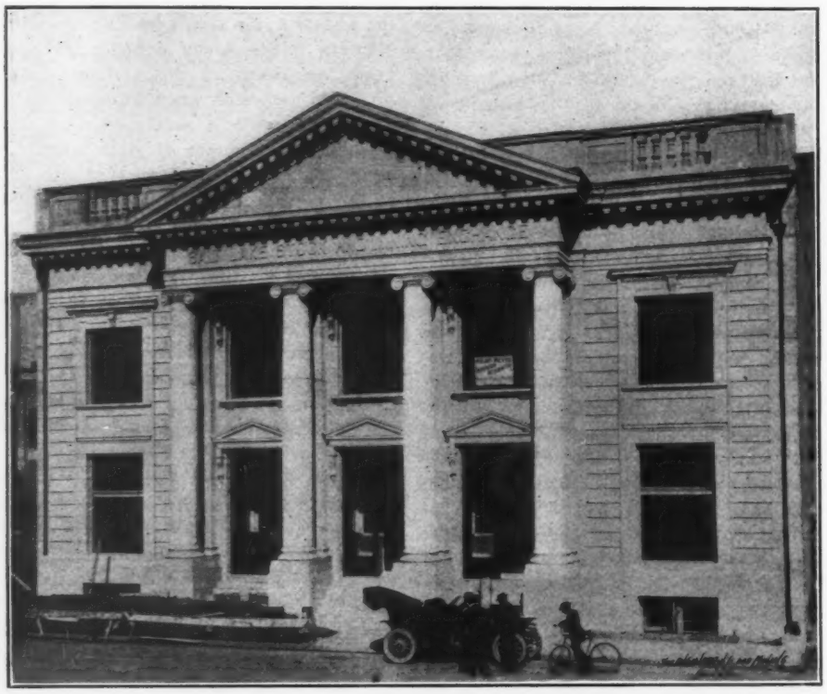
What is claimed to be the first rolling mill in America was the Rokeby mill, four miles south of Coatesville in Chester county, Pennsylvania. It was built in 1799, by Isaac Pennock.

The Salt Lake Stock and Mining Exchange

The association known as the Salt Lake Stock and Mining Exchange recently took possession of its new building which has been erected at a cost of approximately $80,000. The site for the building was donated by Samuel Newhouse. The new exchange is situated on Exchange place close to the new Commercial Club, and the Boston and the Newhouse buildings, and within a half block of the post office.

There were no formalities at the opening call other than an address by James A. Pollock, president of the association.

The stock exchange has been renting quarters on Second South for about 12 years, and in that time has built up an association that stands high among the mining exchanges of the country. The trading on this exchange during the ten months, January to October, 1909, inclusive, amounted to 30,453,068 shares of a total value of $16,297,610. The totals of 24,180,043 shares worth $14,610,059 represent the same period of the previous year.



NEW QUARTERS OF THE SALT LAKE STOCK AND MINING EXCHANGE

Pittsburg Coal Company

The dividend outlook for the Pittsburg Coal Company appears still to be uncertain. The company next April will owe 35 per cent. to preferred stockholders, having paid nothing since the 1¾ per cent. in April, 1905. Recent activity in the company's stocks on the New York Stock Exchange is thought to have reflected buying for control, but it is expected that the present management will be continued. The company will soon be rid of floating debt, and a small dividend may be paid in April.

Copper in the Philippines*

BY WARREN D. SMITH†

During 1908-9 there was practically no production of copper, in spite of the important deposits existing in the islands. The Mancayan copper mines in Lepanto have been visited by a representative from a large company in the United States, but unfortunately no satisfactory arrangements could be made as regards price. It is reported that recent development work has shown the existence of ore in the lowest level of this mine. The Lepanto Mining Company had been granted a franchise to construct a railroad from the mines to the coast, but this has been allowed to lapse. Assessment, prospecting, and some development work are being carried on on other claims in the vicinity. A good road with fairly low grades is now being built from the coast at Tagudin, to Cervantes, and Baguio is being connected with Cervantes by another road which will pass through Suyoc and Mancayan. The construction of these roads will be of great advantage, as the lack of transportation facilities has greatly hindered the development of this district, which will now have two outlets to the coast.

In Masbate prospecting has been carried on in the newly discovered copper district northeast of the town of Milagros. The felsitic rock carrying native copper has been found to extend over a considerable area and 500 kg. of picked specimens of this rock which were shipped to a smelter at Tacoma showed, besides copper, gratifying returns in gold and silver. This deposit of native copper was known to the Spaniards and prospecting has been carried on intermittently since the beginning of the last century.

More promising, however, is the new field discovered by Mr. Brobst about 6 km. to the southeast of the native copper deposit. Here there is a series of several small veins, some of copper sulphides carrying values in gold and silver and others of silver-bearing galena. These veins have not as yet been opened up to any extent, but prospecting and development are being carried on vigorously.

Copper ores are also known to exist in the provinces of Ilocos Norte, Pangasinan, Ambos Camarines and Batangas on the island of Luzon, on the island of Marinduque and in the subprovince of Bukidnon and the province of Misamis on Mindanao.

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*From "Mineral Resources of the Philippines," Bureau of Science, Manila.

†Chief of Division of Geology and Mines, Manila.

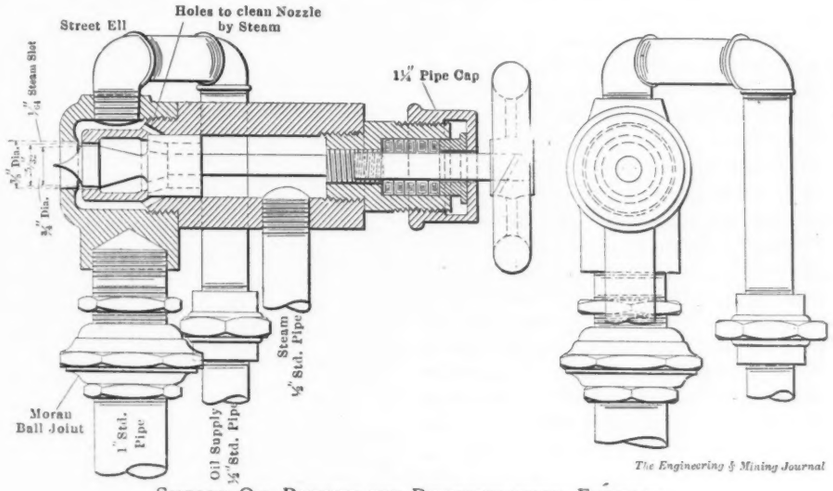
Oil Burners for Reverberatory Furnaces

By Charles F. Shelby*

Among the many points that enter into the operation of an oil-fired reverberatory furnace, one that should be given considerable attention is the design of the burner. It is true that almost any makeshift of a mechanical device for the purpose of atomizing the oil and injecting it into the furnace will perform the work in some sort of a manner. But as economy and efficiency are all-important points for successful operation, the design of the burner should receive the same consideration as any other feature that is brought into action.

At the works of the Cananea Consolidated Copper Company there has been in operation since Aug. 1, 1908, an oil-fired reverberatory furnace the inside measurements of which are 19 ft. wide by 100 ft. long. When this furnace was started up there was no one in the company's organization who had had any special experience in this line before, and the knowledge of our staff as to the efficiency of burners was confined to those that had been proved under boilers. Accordingly, operations were commenced with burners of the Hammel type. These are very common, especially in the Southwest, and are used with great success under boilers generally and in the firebox of locomotives. The same may be said of the Kittle burner, which was also given a trial on this furnace. Both these burners gave what might be considered fairly good satisfaction, and were economical in the consumption of steam; however, as more proficiency was gained in handling this furnace it was noticed that the heat was much more intense at the firing end than near the flue leading from the furnace. This might indicate that the furnace was too long, but the experience at other places indicated coal-fired furnaces even longer than the Cananea furnaces were operated satisfactorily, and with an abundance of heat at the farthermost end of the furnace. If this could be done with coal, there was no reason why it should not be accomplished with oil.

The design of the Hammel and Kittle burners, and in fact nearly all good burners that are used for atomizing oil under boilers, is such as to get immediately the finest atomization of the oil possible, in order to get quick combustion and to spread the flame. With the long Cananea furnace this was not what was wanted; on the contrary, what was needed was an atomizer that would impart velocity to the stream of atomized oil and tend to prevent immediate expansion.

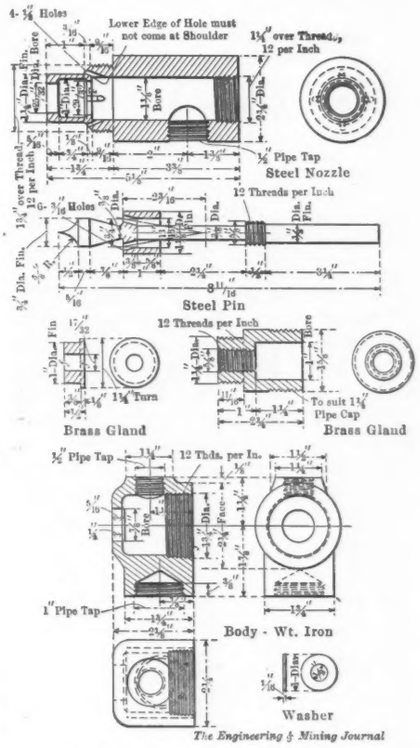


Shelby Oil Burner for Reverberatory Furnace

The illustrations herewith show the burner that was finally adopted as most efficient. The burner is mounted on a pedestal and with a universal joint in order that the direction of the flame may be controlled. The oil enters through the pipe marked "oil supply," and passes into the annular chamber shown and is discharged therefrom through an orifice 7/8 in. in diameter; this is done with a pressure pump at about 40 lb. pressure gage. The steam, at about 125 lb. pressure, comes in through another pipe which fits within the oil chamber, thereby partially heating the oil before it is discharged into the furnace. The steam passes out through an annular opening (the outside diameter of which is 25/32 in., the internal diameter being 3/4 in., thus giving an aperture 1/64 in. wide), and comes in contact with the film of oil, forcing it into the furnace with great velocity and thoroughly atomizing it at the same time.

There is a steel pin or piston that forms the inner portion of this steam circle, and which is movable by means of a hand-wheel and screw threads, so that the operator can at any time enlarge this steam opening to its full size of 25/32 in., the increased volume of steam freeing the steam compartment of any scale or sediment from the pipe, or from other places in which it may have collected and tended to stop up the permanent steam opening. While doing this he automatically admits a large volume of steam into the oil chamber also blowing this clean in the same operation.

The general design of the burner and details thereof are shown in the accompanying engravings. There is also shown a modified form of nozzle that gives practically the same results except that it has a tendency to throw the flame still farther into the furnace. The steam aperture in this case has been reduced to an opening 7/32 in. in diameter, in place of the annular opening previously described, both having approximately the same area. At Cananea the modified form of nozzle has given the better results, possibly in view of the fine machine work that is called for in connection with the other design, and which is difficult of execution. Unless the greatest care is exercised in its manufacture, the annular steam aperture will not be true, and the flame will then be exaggerated considerably on one side.



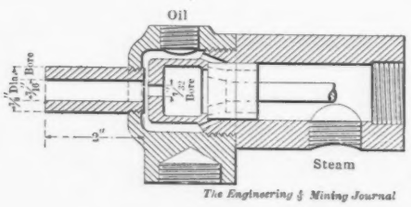
Details of Shelby Burner

The dimensions of this burner were arrived at after a careful study of the quantity of steam that is required to properly atomize a given quantity of oil; and these burners, when handling from 50 to 60 bbl. of oil per 24 hours, will atomize it perfectly with 0.3 to 0.4 lb.

*Superintendent, reduction division, Cananea Consolidated Copper Company, Cananea, Sonora, Mex.

of steam per pound of oil. Or, figuring exactly 0.35 lb. of steam per pound of oil, and an evaporating efficiency of the oil in the boilers of 14 lb. of water per pound of oil, these burners then require about 2 1/2 per cent. of the oil for their operation.

There are all kinds of oil burners on the market; some are simple in construction, and, when properly handled, are also efficient. I have seen many boiler rooms fitted up with nothing more nor less than an elbow screwed into a 3/4-in. pipe, the other end of the elbow being



MODIFIED NOZZLE

stopped with a plug and a hack-saw slot in the elbow in line with the central axis of the 3/4-in. pipe This would be the oil supply. Inside of the oil pipe would be a 1/4-in. steam pipe, both being controlled by simple valves. In many instances the elbow is replaced by simply flattening the end of the pipe. Even these crude affairs in the hands of proper operators give efficient and economical results under boilers; at the same time, if the fireman is not attending to his business, they can be exceedingly wasteful of steam.

With the burner described in this article, the maximum quantity of steam that can pass through the same is beyond the control of the operator, and is only changeable with the pressure of the steam, which seldom varies to any considerable extent in well operated plants. At Cananea, the steam valves to these apertures are left wide open all the time, and the quantity of steam consumed is considered beyond the province of the furnaceman; the oil being held at a constant quantity, the results are then proportional. As far as I know the design is original and it is not patented. Aside from its use in reverberatory furnaces, I should think a burner embodying these same principles would be efficient in rotary cement kilns or other places where a long flame was desired.

The American Vanadium Company of New York owns the Minaragra mine in the Province of Cerro de Pasco, Peru, considered to the one of the richest vanadium deposits in the world. It is in this mine that the mineral rizo-patronite, a vanadium sulphide was discovered by the Peruvian engineer, Antenor Rizo Patron. The company has been shipping ores averaging 20 per cent. vanadic acid.

Mining Methods at the Cabin Branch Mine, Virginia

BY JOHN TYSSOWSKI

The Cabin Branch mine, situated about a mile from Dumfries in Prince William county, Virginia, has been operated with few interruptions since 1889. It is essentially a sulphur (pyrites) mine, although a 50-ton smeltery was erected at Barrows siding, where the company's six miles of narrow-gage railroad connects with the main line of the Richmond, Fredericksburg & Potomac Railroad. The idea was to treat the copper ore sorted from the run-of-mine pyrites. Heap roasting was tried, but almost immediately abandoned, and from that time only cinder has been treated at infrequent intervals. At present the smeltery is not in operation.

The orebody at the Cabin Branch, the nature of which has not been definitely proved, dips at from 45 to 60 deg. and strikes in the northeast and southwest direction, varying from 6 to 14 ft. in thickness and having a horizontal extent, ranging up to 1000 ft. The single compartment shaft is sunk in the ore, and as a consequence, is rather irregular in grade, thus limiting the speed of hoisting. A depth of approximately 1500 ft. has been reached on the slope, and sinking at the rate of 20 ft. per month is still in progress. Near the bottom of the shaft several normal faults were encountered, so that the ore crosses the shaft, being above it at the date of this writing. The ground is fairly good, both walls being of a rather tough slate which stands with little timbering.

STOPE METHODS

Drifts are run from the shaft in either direction to the end of the orebody at intervals of 100 ft. or less. A raise is then driven from the end of each drift to the level above, if it has not caved; or, if the ground above is treacherous or heavy, from two to six feet of ore are left as a pillar to hold the drift floor above and keep material from coming down upon the men in the stope. This pillar is kept as narrow as the nature of the ground will permit, as it only forms a temporary protection for the men while stoping below it. The raise is carried about 20 ft. wide.

After opening up the raise a sort of modified system of retreating-longwall mining is carried on. Beginning at the end of the drift, the ore is mined back to within about 30 ft. of the shaft in successive strips across the face of the stope from the drift below to the pillar above. One four or five-foot hole loaded lightly with 40 per cent. dynamite usually suffices to break the ore from foot to hanging. The ore is all mined by contract, and the fact that drill runners, working two men to the drill, using light tripod machines and furnishing their own powder, caps and light, can earn good living wages breaking the ore at about 20c. per ton, proves that the mining method is well adapted to the conditions met. By this method of mining probably nine-tenths of the ore is recovered.

The ore runs and is mucked down the stopes and loaded into 1-ton end-dump cars from the floor of the drift. Owing to the steep dip of the footwall in most places in the mine, the broken lump ore runs freely to the bottom of the stope. The ore makes a comparatively small percentage of fines, which have to be mucked down the stopes. By thus taking advantage of the slope of the orebody a minimum amount of labor is necessary to deliver ore to the haulage levels.

TIMBERING

No timbers are used in the drifts but stulls or props of Virginia pine are used in the stopes, the usual space between timbers being 6 to 10 ft. No attempt is made to pull these timbers, but the ground is allowed to cave behind the working face as it will. The hanging-wall, however, sometimes holds for years. In the steeper stopes some difficulty is experienced from the lump ore knocking out props as it bounds down the foot-wall.

The air in the Cabin Branch mine is good and the ventilation almost takes care of itself. For about three-quarters of the way down the incline a ladder and pump way is maintained in the shaft but in the lower levels, this is run through small raises driven in the ore at about 20 ft. from the shaft. It is claimed that by carrying these connections between levels in this manner better air circulation is promoted.

Natural Gas in Hungary

The first important discovery of natural gas in Europe is reported from Kis-Sarmas, in the district of Klausenburg, in Hungary. Its presence first became known two years ago when shepherd boys used to light the vapors rising from the marshes.

Upon a geologist's report the ministry of finance directed borings to be made, when large quantities of gas were discovered at a depth of 60 ft. The borings were continued to a depth of 600 ft., when the gas was found in such volume that big stones were thrown into the air by it. At the present time the gas is flowing out of a pipe with a noise that can be heard six miles away. The flow is estimated at 6,000,000 cu.ft. per 24 hours.

Analysis shows that it is a peculiarly clear methane gas, containing scarcely ½ per cent. of nitrogen. Upon the advice of experts the Hungarian ministry of finance has bought the gas-mining rights for $21,000. It is proposed to utilize the gas supply in running a large central electrical plant to be built on the ground.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. P. Hutchins recently returned to New York from Siberia, and has now gone to the West.

Thomas L. Lewis has been reëlected president of the United Mine Workers of America by a large majority.

Desaix B. Myers, of Los Angeles, Cal., will be at Culiacan, Sinaloa, Mexico, from Jan. 1 until Feb. 15, and will then return to Los Angeles.

J. W. Millar, of New York, is constructing a mill and cyanide plant for the Maria Gold Mining Company at Chinacates, Durango, Mexico.

T. C. DeSolar has succeeded R. Sheldon Smillie as chief engineer for the Quincy Mining Company at Houghton, Mich. Mr. Smillie has gone to Colorado.

Robert B. Brinsmade has been appointed professor of mining engineering in West Virginia University, at Morgantown, and will begin work there in January.

Hartwell Jalonick has returned to El Paso, Texas, from a trip to Sonora, Mexico, where he installed electric light and telephone systems for the Minas Pedrazzina Gold and Silver Company.

F. F. Sharpless has returned to New York after making an examination of the Santa Gertrudis mine, at Pachuca, Mexico. Early in January he expects to start for the west coast of Africa, to be there about six months.

Thomas W. Woodbridge, for the past two years chief chemist and assayer for the Western Ore Purchasing Company, has resigned in order to accept a similar position with the Arizona Consolidated Copper Company, at Humboldt, Arizona.

Obituary

Patrick Harley, one of the pioneers of the Comstock, died Dec. 15, at Virginia City, Nev., where he had lived since 1860. He was connected at different times with nearly all the leading Comstock companies.

Thomas J. Morrell, who a number of years ago was in charge of the chemical laboratory of the Cambria Steel Company, at Johnstown, Penn., died in Boston, Dec. 16, aged 68. He was a nephew of the late Daniel J. Morrell, one of the builders of the Cambria Iron Company, and was an authority on the metallurgy of iron and steel.

James W. Friend died at Pittsburg, Penn., Dec. 26, aged 64 years. He was born and educated in Pittsburg, being a grandson of James Wood, who was long a prominent iron maker. When a young man Mr. Friend entered business as an iron broker and was successful. In 1886, in connection with F. M. Hoffstot, he bought the Southside plant of the old firm of Graff, Bennett & Co.; to this they added in 1900 the Schoen plant at McKees Rocks. They then organized the Pressed Steel Car Company, of which Mr. Friend remained vice-president until his death. He had also considerable investments in banks, and was prominent in several clubs.

William Clark Magee died at Pittsburg, Penn., Dec. 26, aged 54 years. He was born at Enon Valley, Penn., but early removed to Ohio. As a boy he began work as a telegraph operator on the Cleveland & Pittsburg railroad, and worked 10 years for that road and the Baltimore & Ohio. In 1880 he entered the coke business, at first with the Schoonmaker Coke Company and later with the H. C. Frick Company; finally becoming vice-president of the latter company. He retired from the Frick company in 1903, and later organized the Consolidated Connellsville Coke Company and the Pickands-Magee Company, being president of both companies, which are largely owned by Cleveland iron interests. Mr. Magee never married; he took much interest in the Pittsburg Art Society, and other local associations.

John Valentine Bohn died of typhoid fever at Copperhill, Tenn., Dec. 22. He had been general superintendent of mines for the Tennessee Copper Company since June 15. Mr. Bohn was born in Dayton, O., April, 1868. He spent two years at Washington University, St. Louis, one or two years at Cornell, and graduated as a mining engineer at the Colorado School of Mines. His father, Maj. A. V. Bohn, has been identified with Leadville from its first days, and John spent some time there. He was also with the Braden Copper Company in Chile, at Trail, B. C., in Butte, Mont., and in California. He was with the American Smelting and Refining Company under Pope Yeatman for a time. Mr. Bohn leaves a wife but no children. He married Miss Belle Howell, daughter of Admiral J. A. Howell, U. S. N. He was a man of considerable force of character and was beloved by all those who worked for him and came in contact with him. He leaves a splendid record of hard work and successful management of whatever was entrusted to him.

John Wellington Nesmith, president of the Colorado Iron Works Company, died Dec. 17, aged 76. He had been in splendid health and attending to his usual business occupations until a few days before, and his death came as a shock to his relatives and friends. Mr. Nesmith had been identified with the progress of the West from the early days, coming to Colorado in 1860, engaging in mining and milling in Gilpin county. He subsequently became interested in Langford & Co.'s foundry, the nucleus of the Colorado Iron Works, of which he became manager in 1879 and president in 1886. In the advance in ore-treatment methods he took an active interest, and specialized in the blast-furnace smelting of lead and copper ores from the time of the first application of the process, achieving a wide reputation for the Colorado Iron Works in this line. Mr. Nesmith was a past-master mason and past high priest of the Royal Arch masons, vice-president for Colorado of the National Association of Manufacturers, a member of the American Institute of Mining Engineers, the Colorado Scientific Society and of various other organizations.

William Dunham Kelly, president of the Clearfield Bituminous Coal Corporation, died Dec. 9, at Atlantic City. He was a native of Geneva, N. Y., and his business life was entirely devoted to the work of the exploitation and development of the bituminous coalfields of Pennsylvania, in which he was largely interested. His first business experience was gained in the office of Jervis Langdon. While still a young man he became secretary of the McIntyre Coal Company, which for many years prosecuted mining operations along the line of the Northern Central in Lycoming county, Penn. The exhaustion of that field led him to turn his attention to the territory tributary to the Beech Creek, Clearfield & Southwestern, then in process of development, and he cast his lot with the notable group of men back of that project, of whom S. Richard Peale, of Lock Haven, is sole survivor. In the course of the several reorganizations that never fail to go hand in hand in such undertakings, the Beech Creek railroad emerged as the successor of the original railroad corporation and the Clearfield Bituminous Coal Corporation as that of the original coal company that was formed to acquire lands along the railroad right of way. Upon the reorganization of the coal company, Mr. Kelly became its president and the chief factor in its long and successful career. In addition to his coal interests he was a director in many railroad and banking corporations.

Societies and Technical Schools

Iowa Coal Operators' Association—At the annual meeting at Des Moines a new constitution was adopted which makes the president commissioner and working head of the association. The officers elected are: President and commissioner, John P. Reese; vice-president, David Dinning; secretary and treasurer, E. M. Gray. The executive committee is as follows: First district, L. L. Lodwick, Mystic; Second district, H. L. Waterman, Ottumwa; Third district, H. M. Schuler, Des Moines; Fourth district, H. H. Canfield, Boone.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON IMPORTANT EVENTS FROM MANY IMPORTANT MINING CENTERS OF THE WORLD

San Francisco

Dec. 22—One of the Sacramento newspapers recently sent a communication to the chief of army engineers at Washington, which was subsequently referred to the United States Engineers' office in San Francisco for a reply, in which the question was asked as to the jurisdiction of the California Débris commission over the dredge-mining industry and its power to prevent further obstruction to the river channels. Col. John Biddle, of the corps of engineers, and president of the California Débris commission, has answered this letter quite fully. He calls attention to the fact that the Caminetti act, which created the commission, requires it to mature and adopt such plans as will improve the navigability of the Sacramento and San Joaquin river systems, deepen their channels and protect their banks to prevent encroachment and damage from débris resulting from mining operations, with a view of restoring as far as practicable the conditions existing in 1860. Colonel Dibble also quotes the river and harbor bill of June 3, 1896, which provides that a board of three officers of the corps of engineers be created to examine into possible plans to improve the rivers named and to maintain navigation thereon. The members of the California Débris commission are members of this same board, thus acting in a double capacity. The act of March 3, 1899, Colonel Biddle says, also prohibits the creation of constructions in rivers or discharging into them any material which shall be deposited on the banks of rivers so as to probably interfere with navigation. Therefore, it is the contention of Colonel Biddle that even if the California Débris commission itself, in its official capacity, does not undertake to impose regulations on dredge mining, its members have authority to insist upon the observance, by those engaged in gold-dredging operations, of the laws of the United States for the protection and preservation of the navigable waters, whether such operations are carried on in or on the banks of a tributary of a navigable stream. The Government engineers composing the California Débris commission, either in their capacity as members of the commission, or as Government engineers, therefore contend that they have authority over dredge mining as well as any other form of mining which may cause impairment of the navigable waters of the United States in the State of California. Thus far these engineers have in no way interfered with the dredge men, or made any extended professional examination into their work as far as the mining operations themselves are concerned.

There is complaint throughout the mining sections of the State that mineral lands are being constantly taken up by people filing agricultural homesteads upon them. Some of these fraudulent homesteads even cover claims which are taking out and sacking ore to be shipped to a mill. The whole trouble about this is that the mining people who know of such transactions do not take the trouble to appear before the land office and offer testimony as to the mineral character of the land. The agricultural claimant brings friends to testify that the land is not mineral who would not know mineral if they saw it, so they freely give the testimony desired. But unless some interested party comes and states his knowledge of the mineral character of the land, it ultimately passes to the agricultural locator, and in nine cases out of ten no one is directly interested enough to go to the trouble and expense of coming to the land office with his testimony. If, of course, some man may have a claim on the land he will go, but if no one owns any mining claim on the land located, even though hundreds know it is really agricultural, there is no contest and the lands drift out of the mineral domain. All through the mining counties are hundreds of "ranches" a thousand times more valuable for mining than for agriculture, and they were obtained because nobody protested against agricultural entry. The evil is one of long standing The California Miners Association tried to prevent illegal locations, but it was found that each one must stand alone, and no general law covered the situation aside from those existing. Provision is made to prevent mineral land being taken up as agricultural, but certain testimony is required and this is seldom forthcoming, owing to lack of general interest among the mining people.

The creditors of the Trinity-Bonanza King Mining Company, of Trinity Center, Trinity county, have filed a petition asking that it be adjudged bankrupt for the reason that its directors at a regular meeting on Nov. 30 admitted in writing that the company was unable to pay its debts and its willingness to be adjudged bankrupt. The Safe Deposit and Trust Company is owed some $10,000, and the Trinity Power and Water Company has a balance due of $230,000, among other creditors. This is the mine which the Treadwell Brothers, formerly of Alaska and later of the Tesla coal mines in California, financed. They put in a magnificent equipment and, among other things, a 40-stamp mill, but there was never ore enough to keep things going so the mine shut down. When the California Safe Deposit and Trust Company failed it involved the Treadwell Brothers, and this involved the mining company.

Further proceedings in the suit of the Kennedy Extension Mining Company against the Argonaut Mining Company, of Jackson, Amador county, are in the nature of subpœnas and motion for an order for a survey of the Argonaut's underground works. The subpœna against E. V. Zumbiel, the secretary of the Argonaut, commands him to bring into court maps, diagrams, sections and other drawings relating to the mining operations underground having any bearing on operations conducted through the Argonaut shaft, and particularly underneath the surface boundaries on the Muldoon and Jackson quartz claims.

An order has been obtained from the court giving the administrator of the estate of the late John Philips the power to sign the bond and lease given on the Serita mine in Masonic district, Mono county. The mine lies adjacent to the Pittsburg-Liberty group and is considered quite valuable. It will now be developed. The persons taking the bond are Messrs. Shearer and Perrini, of Masonic.

Denver

Dec. 26—The methods of handling ores in the Cripple Creek district are somewhat peculiar. They are based entirely along practical lines. In the first place, it should be noted that the tellurides being friable, the valuable minerals go almost entirely into the fines, so that the first process is screening, the fines invariably running pay.

The coarse rock is next hand sorted and in part cobbed, the remaining coarse rock being, at the small mines, thrown over the dump. In recent years, however, a washer of the trommel variety is included in the equipment of the larger mines, the object of which is to recover a further paying product, by washing the fines off the coarse rock. This is a standard practice today.

Various attempts have been made from

time to time to treat the old unwashed dumps by trommel washers, with more or less success. At least one attempt was made at the Last Dollar mine to crush the rocks so as to increase the quantity of fines, but it was not successful. This is the only case I know of where crushing was tried.

The tonnage that is now going to the valley mills and smelteries is in the neighborhood of 40,000 tons per month. Of this tonnage the smeltery gets about 4000 to 5000 tons per week; the Golden Cycle cyanide plant about 21,000; the Portland about 8000; the U. S. Reduction and Refining plants 7000. From which it may be observed that the valley mills are not running up to capacity, and the practice of at least one of the plants is to make up the deficiency from the dumps, the paying qualities of which are largely conjectural.

Butte

Dec. 23—There seems to be doubt in Butte as to the feasibility of the creation of a department of mining by the Federal Government. While it is generally conceded that the idea is a good one, yet it is thought that inexperienced college men will be put in charge and allowed to dictate to the practical mining men who now have charge of most of the mining properties. Of course, if the Government would pay enough to secure the services of able men in that line, then the department would no doubt be a beneficial institution, but it is an accepted fact that the Government does not pay enough to attract the most able man. The frequent clashes between Chief Forester Pinchot and those who are using the national resources has in a measure taught the West to look with suspicion upon any active attempt by the Government to regulate the industries of the West.

Deputy Mining Inspector W. B. Orem, having the Butte district under his immediate supervision, has submitted his annual report to the governor. The report states that ventilation fans have been installed in a number of the Butte mines with admirable results. In addition to that at the Rarus, the fan at the Coalition's Cora, with a capacity of 180,000 cu.ft. per min., has greatly improved ventilation at the Diamond and East Gray Rock mines, the mining cost of the latter having been reduced 60c. a ton as a result. At the 1200-ft. level of the Pennsylvania mine, a fan having a capacity of 50,000 cu.ft. per min. is giving good results. Mention is also made of the crosshead invented by Superintendent Bryant of the Original Mining Company for the prevention of mine accidents due to the old-style crosshead hanging up in the shaft and then getting loose and falling on the miners riding on the bucket. The Bryant crosshead is constructed on the lines of a skeleton cage with a deck for the men, protected by a bonnet and having safety dogs.

It is rumored that the Butte & Superior Copper Company is negotiating for the control of the Butte-Milwaukee property. The control of the Butte-Milwaukee company is held by the Butte & New York Copper Company, which owns about 80 per cent. of the operating company's stock.

Scranton, Penn.

Dec. 27—The supply shaft of the Capouse colliery, owned by the Scranton Coal Company, in Keyser valley, near Scranton, was destroyed by fire on Dec. 23, and as a result over 500 men and boys are thrown out of work. The shaft was used not only for the lowering of supplies and workmen into the mine, but coal from the lower veins was also hoisted through it. One of the two mine fans was in the shaft, and this fan was destroyed, so that the ventilation of the mine is cut off by half, rendering operations in the mine for the present impracticable. There were a number of men at work in the mine at the time the fire was discovered. The first intimation that the miners had of the fire was the sudden attenuation of the circulation of air through the workings, by the stoppage of the destroyed fan. The other fan was, however, kept in full operation, and the men employed in the workings were able to escape. Four of the men climbed through the shaft for 150 ft. to another vein. According to the officials the miners behaved with coolness.

Unlike the breaker fires that have occurred recently in this locality, which, unfortunately, have been numerous lately, the origin of the fire at the Capouse colliery shaft admits of partial explanation. Engineer Albert Thomas, who was in charge of the machinery at the time the fire broke out declares that in his opinion the fire was started from a hot box of the fan axle. Before he could do anything, however, after he observed indications of a fire, the tower, which was entirely of wood, was a mass of flames. The engineer then turned his attention to the rescue of the men in the mine. The fireboss, John Morris, at the imminent risk of his life, was lowered through the burning shaft to the China vein 560 ft. below, where five men were employed at rock work. Then after systematic effort all the men in the mine were taken out. The supply shaft was built about 25 years ago. It was overhauled and modernized about two months ago at a cost of $30,000. The shaft will again be repaired, probably this time reinforced by concrete.

The Lackawanna company has intimated that it will not employ in its mines or around its breakers any boy under the age of 16, although the law permits it. A boy may work in the breaker at the age of 14 and become an inside worker at 16. General Superintendent Loomis, of the coal department of the Lackawanna, believes that a boy should be at least 16 before he is permitted to work in or around the mines in any capacity. In his opinion, it is an injustice to the boy, is uneconomical for the company, and is a disadvantage to society. Other coal companies will probably follow the example of the Lackawanna.

Toronto

Dec. 24—Gold bricks of the value of $50,000 have been received from the Yukon at the royal mint, Ottawa, where they will be coined into the first Canadian gold currency as yet issued. Last summer a few English sovereigns were coined at the mint from Larder Lake gold, but no Canadian pieces have hitherto been issued. Hon. W. S. Fielding, finance minister, recently announced that arrangements were being made for the issue of Canadian $5 and $10 gold coins. At present practically all the Yukon gold is marketed at Seattle, or other American cities, but it is now proposed to establish a government purchasing office in Dawson, where miners can get full value for their gold, saving the 2 per cent. charged by the banks for handling it, and enabling the mint to make a small profit on its coinage as is done in other countries.

As a result of the continued rush to the Porcupine Lake goldfields three new townsites are to be laid out. These are Frederick House, at the entrance of the Frederick House river into Night Hawk lake; Redstone at the entrance of the Redstone into Night Hawk lake; and Porcupine in Whitney township on Porcupine lake. Milepost No. 222 on the Temiskaming & Northern Ontario Railway, now known as Kelso Mines, is coming into favor as the most convenient point of departure for the Porcupine Lake region, as the distance to be traveled by team is approximately only 30 miles, being 10 miles shorter than the road from Matheson. Many outfits continue to leave for the goldfields from Cobalt, Haileybury and other northern mining towns, and there is great activity in road construction, building, forwarding of supplies and other preparations for an active winter season.

Mexico

Dec. 24—Pozos is an old camp in the eastern part of the state of Guanajuato, Mexico. The entire camp is in the hands of Mexican capitalists, having never yet attracted foreign capital. The most famous mine in the district is the Santa Brígida, which was first opened by the Jesuits and worked by them until their expulsion from the country. The ore is complex, containing copper, gold, silver and some blende. Santa Brígida has produced in the past several famous *bonanzas* and an effort is now being made to adapt some process to the economical ex-

traction of the metal contained in its ore. The property is equipped with steam hoists, tramway and other mine-working machinery, and furnaces for smelting the high-grade ore from the mine. The Cinco Señores property, comprising several different mines in the district, has just finished installing a cyanide plant. The company has a large tonnage of low-grade ore which it expects to mill profitably by cyaniding.

Compañia Minera Angustias, Dolores y Anexas, owns several good mines in the Pozos district. These mines have just been unwatered, and the Dolores vein shows especially good values. Milling ore is being accumulated, preparatory to starting milling operations. The milling ore averages 500 grams silver and 20 grams gold per ton. The mill belonging to this company is located in San Luis de la Paz, five miles from Pozos, to which plant the ore is transported by a narrow-gage road. The mill is now being remodeled and rebuilt for cyanide treatment, under the direction and after designs of H. A. Megraw.

Formerly all the mills and haciendas pertaining to the Pozos mines were in San Luis de la Paz, as being more accessible and a better situation for the plants. The Cinco Señores company is the first to remove its mill to Pozos. In San Luis de la Paz are now only two operating mills, that of Santa Elena, belonging to the Compañia Minera Angustias, Dolores y Anexas, and the Ojo de Agua mill, belonging to Bermejillo y Cia., of Mexico City. The latter is strictly a custom mill and operates on Pozos ore. This mill is under the direction of W. C. Buchanan.

The Guanajuato Electric Company will build a transmission line to Aguascalientes, Mexico, to supply the American Smelting and Refining Company and the mines at Asientos and Tepezala with power. Bonds to the extent of $800,000 have been placed in England and the funds will be devoted to bringing up the capacity of the company to 23,000 h.p. A third power plant is to be built on the Angulo river in Michoacan.

The state government of Durango, Mexico, has made a contract with Harris Walthal, representing foreign capital, for the construction of a railroad from the city of Durango to the mining town of San Dimas. The line will open the San Dimas, Guarisamey and other important Durango mining districts.

London

Dec. 22—A proposal has recently been made by a representative of one of the leading financial houses of the Rand that the system of reporting monthly the working results of the mines should be discontinued. It was urged that the present system did not make for economy. In order to maintain a regular production, it was necessary to move the labor force underground about more than would otherwise be necessary. If the statistics were prepared to cover longer periods than one month, there would be a saving of time and labor. Arguments of this description are not very convincing and it is not surprising to find that the proposal has been generally condemned. By the publication of monthly returns, shareholders are kept in touch with what is going on much better than if the figures were given once a quarter or once a year. Statistical records have to be kept on every mine and whether they are totaled up and averaged over short periods or over long can make little difference as far as expense is concerned. Indeed, it is an advantage to have them prepared for short periods as it enables a closer watch to be kept by the manager over variations in costs or output. There is something to be said for curtailing the information that is cabled monthly to London. It is, for example, questionable whether there is any advantage in publishing the different sources of the gold; whether it comes from the plates or from the cyanide works does not interest the average shareholder, who only desires to know the working profit for the month.

The weak point about the returns of the South African mines, and that which curiously enough has not been noticed in the discussion in the press that the new proposal has drawn, is that the returns are not accurate, at least in a good many cases. This arises from the policy, which the Rand mining houses have adopted, of aiming at nonfluctuating outputs. They wish to prevent shareholders being unduly elated or depressed by fluctuating returns, and so, in order to keep up this pretense of regularity of output, they maintain what is called a reserve gold account, which is drawn on or added to according as the fluctuations of the monthly production require. There is no secret about it, because the position of the gold reserve is announced every month so that any shareholder who takes the trouble can see whether the month's work has been a good or a bad one. This system, although very praiseworthy in theory, breaks down in practice, in fact, whenever the true average production of the mine has been miscalculated. Then, when the annual report comes out, the shareholder finds that his monthly profits as advertised have been either under or overstated.

The maintenance of a fairly even grade is, of course, desirable; but no one has any justification for grumbling if fluctuations occasionally occur and the confidence of the public in the mine and its management would be quite as strong if not stronger, were the actual results published, instead of fictitious results; as they are now in many cases. Another change in the system of reporting results that might be made with advantage is a clearer definition of the word "profits." The profits published are the difference between the amounts charged to working costs at the mine and the value of the yield. The figures are far from being divisible profits. As a round figure, the dividends are only about 70 per cent. of the declared profits. It ought not to be difficult to estimate closely the amounts required for depreciation, head-office expenses and taxes, so as to show more accurately than at present the true profit made. This practice is carried out by several of the mining companies of Mexico and the United States that are controlled from London.

As regards the reporting of ore reserves it would be an advantage if the mining companies practised greater uniformity. In some cases the ore developed is calculated over the stoping width, while in others it is over the milling width. The milling width, it may be explained, is the estimated width of ore actually milled, that is to say, it is the stoping width less the amount sorted. Ore calculated over the milling width is, of course, the best way of reporting ore reserves, as it gives the actual tonnage that will be milled. A further step toward avoiding confusion as to the value and tonnage of ore developed would be the conversion of pennyweights into shillings. Instead of reporting the ore reserve, for example, as having a content of 8.1 dwt., it would be better to state the value as 0.34s., the pennyweight being equal to 4.2s. This would give the gross value. The net value, which also might be stated, would be the gross value multiplied by the percentage of extraction.

The ups and downs of mining are well exemplified in the case of the Ashanti Goldfields Corporation. It was only a year ago that the corporation was unable to raise the funds necessary to increase the milling plant owing to objections raised by the debenture holders. During the past year the development of the mine has been of a most satisfactory character and a large increase of the ore reserves has been obtained. Today the company would have no difficulty in raising a large amount of fresh capital if it required it. A year ago the corporation's shares were valued on the market at 12s.; today they are over £2. This change in the fortunes of the mine is due to a vigorous policy of mine development and to the employment of a trained engineer and geologist in prospecting work. Justice's Find, a large ore deposit of refractory ore of great value, escaped the notice of the untrained native and perhaps of the untrained white prospector, but received proper attention from the technically trained graduate.

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY· INSTALLATIONS· DEVELOPMENT WORK AND PROPERTY TRANSFERS THE CURRENT HISTORY OF MINING

Alaska

New discoveries in the Squirrel River district are reported to be exceptionally rich. The location of the new camp is about 100 miles from Candle in the Kotzebue Sound region.

Brooklyn Development Company—The property of this company at Knik is in good condition and has encountered rich ore in the tunnel. K. A. McKean, Knik, is manager.

It—This mine at Ketchikan, John C. Barber, superintendent, is in ore in the drift from the 175-ft. level.

Goodroe—A shipment of 2700 tons has been made by this mine at Karla bay to Tacoma.

Jumbo—The mine at Sulzer promises to be a large shipper. A lot of 2500 tons is awaiting movement.

Alabama

Tennessee Coal, Iron and Railroad Company—Henry Ellen, the last idle coal mine of the company, has been started up. Work has been begun on the new No. 13 Pratt mine, which will be a shaft opening 2¾ miles northwest of Wylam, on the Pratt seam. Work is in progress on the big pumping plant which is to furnish water to Ensley; steam will be furnished for the pumps by the boiler plant at the mine. At Blocton, in Bibb county, 150 coke ovens have been started, and 200 more are being put in order to start. No. 1 furnace at Ensley, which has been out of blast several months, will be blown in as soon as a supply of coke is on hand. In the steel plant at Ensley two additional open-hearth furnaces are under construction. It is understood that the American Bridge Company will put up works at Ensley, taking its steel from the Tennessee company's plant.

Arizona

Cochise County

Bunker Hill—The mine is being worked between the 200 and 565 levels and is making a shipment of a car a week to El Paso. Development work is being carried on. W. J. Wallace is manager.

Gila County

Miami—By the middle of January the foundation work for the new concentrator and power house will have been completed, and the erection of the steel framework for both structures will be under way. These buildings will be of reinforced concrete. Practically the only woodwork figuring in the construction will be in the launders for the concentrator. Each of the six units of the concentrating plant will have an ore bin with a capacity of 1000 tons. From these bins the ore will be run through rolls and classifiers and thence to the concentrating tables. H. Kenyon Burch is the designer of the mill and has charge of the construction.

Superior & Globe—The station cutting at the 650-ft. level has been completed and crosscutting north and south will be started. The 60-h.p. hoist will be installed at the shaft.

Arizona-Michigan—The north and south crosscuts from the 500-ft. level of the Telfair shaft measure 315 ft. and 340 ft. respectively. The latter has passed from the diorite into conglomerate. The south crosscut is in diorite containing considerable pyrite in stringers. N. A. Nelson is in charge.

Inspiration—The company still has two Star drills on its property in the Miami district. More than 25 holes have been drilled on this property since last spring. Tunnel work will be started in Keystone gulch as soon as the 185-h.p. compressor arrives. A station is being cut at the 275-ft. level of the Scorpion shaft. Crosscutting will be started here to cut the orebody which the shaft went through sometime ago. The orebody dips to the southward. T. R. Drummond, in charge, has 95 men employed.

Silver Queen—This property, at Superior, is under negotiation to representatives of the Thompson-Gunn interests of New York and Salt Lake City. This is one of the first properties worked in Arizona.

Ray-Arizona—P. T. McGrath, manager of this property, in the Ray district, announces that extensive development work will be carried on. About $20,000 has been spent and $50,000 of the purchase price of $75,000 paid.

Old Dominion—The four Nordberg pumps on the 1200-ft. level are nearly installed. These pumps have a capacity for handling 8,000,000 gal. per day for 24 hours, as against a present flow of water of about 3,500,000 gal. The new pumps are expected materially to reduce pumping expenses and permit of development work being carried on in a much more rapid and economical manner. A contract to supply 1,000,000 gal. a day to the Miami mill has been made and the revenue from this will greatly reduce the pumping charge. It is rumored that the company is considering the closing of the smeltery at Globe and the transport of all ore to Douglas.

California

Amador County

Dane & Mitchell—This property near Jackson has been purchased by San Francisco men and Edwin A. O'Donnell of that city will be manager and will equip and reopen the mine.

Butte County

Cherokee Gold Drift—Deeds have been passed making this company the owner of the Cherokee mine, formerly known as the Spring Valley, at Cherokee. The purchase includes all the reservoirs, ditches, etc. The mine, at one time worked by hydraulic process, will now be drifted.

Skyhigh—Arrangements have been completed by which Mayo & Smith will have charge of these mines at Inskip and improvements will be made.

Calaveras County

Scossa—At this mine near Railroad Flat, recently bought by Senator Smith of Hutchinson, Kan., a 10-stamp mill is being erected. The mine is developed.

Eldorado County

Orum—A strike of good ore has been made in this mine near Eldorado and a mill will be provided.

Mt. Pleasant—This mine, Grizzly Flat district, formerly a large producer and for a long period idle, has again come into the producing list under a new management. The company, after expending about $50,000 was forced to close down during the financial panic for a few months, has since resumed operations and finally started its 10-stamp mill on good ore.

Inyo County

Four Metals—The smelter has not resumed operations on this property at Keeler but the tramway is receiving new buckets ready for starting up.

Lucky Boy—In ground of this company covered by the Balzar & Stevens lease, an ore shoot 4 ft. wide carrying mainly silver but with a small quantity of gold, has been found.

Burgess—At this new camp at an elevation of 9000 ft. on the summit of the White mountains, some litigation is expected in connection with the richest claim, the Ironsides. No leases have yet been let in the camp though many miners have applied for them.

SHASTA COUNTY

Uncle Sam—In this mine formerly owned by the Sierra Buttes company, but now the property of J. O. Jilson, the crosscut tunnel has broken into what appears to be the lost vein which the Sierra Buttes company failed to find before it gave up the mine.

Milkmaid Mining Company—This company has sold its mine at French Gulch to Eric Lindbloom of San Francisco, formerly of Alaska. The purchase price is $300,000. The four-stamp mill is to be materially enlarged.

Carnegie Mines Company—This company which owns the Clipper group near Kennett has bought a 20-stamp mill.

SIERRA COUNTY

Standard—From this mine near Downieville, they are shipping high grade "sulphurets."

Rio Antiqua—Superintendent F. W. Kuhfeld of this property at Forest, reports that the raise in the eastern end of the south-fork tunnel is in material which appears to be the bedrock of the much-sought gravel channel.

Oriflamme—The tunnel being run in this property at Alleghany has already cut two veins and is expected to reach the main Irelan vein in 150 feet.

Gray Eagle—At this mine, Gold Point, a strike has been made which is richer than that of a few weeks since. The machinery for the drills has been delivered.

Colorado

Colorado's output of precious and other metals for 1909 is estimated by the U. S. Geological survey to be worth approximately $33,872,631. Of this amount, $22,321,745 is gold, $4,721,786 silver, $1,576,835 copper, $2,674,964 lead, $2,177,418 zinc and $400,000 tungsten.

CLEAR CREEK AND GILPIN COUNTIES

Chase—Boston capital has taken hold of this property and will carry on developments, as the Gilpado Mining Company, Forbes Rickard, manager.

Columbia Tunnel and Mines Company—Gilpin county and Denver men have organized to operate the Moody property in Hamlin gulch. R. L. Hedden, Central City, is manager.

Denver Mining and Reduction Company—The company has a lease on the mill on North Clear creek and will install crushers and Wilfley and Horn concentrating tables, to handle creek dirt and custom ores.

CHAFFEE COUNTY

Vivandiere—This mine at Turret is shipping a car a week.

LAKE COUNTY—LEADVILLE

Cleveland—A 112-h.p. electric hoist is being installed for the company by the Leadville Power and Light Company and will be in operation early in January.

Penn Shaft No. 1—The lessees are shipping 25 tons per diem of good-grade iron-oxide ore.

Colonel Sellers—This old-time zinc producer, which has been idle for some years, is rapidly being put in shape for production again. It is stated that shipments will commence with 100 tons per diem, the ore going to Canon City.

Garbutt—This mine on Breece hill is shipping 75 tons daily with values increasing.

Robert E. Lee—This mine on Fryer hill is shipping iron ore and also sending a fair tonnage of silicious ore to the local smelteries.

LAS ANIMAS COUNTY

Commercial Coal and Coke Company—This new company, with headquarters in Denver, has arranged to open a coal mine and to build 200 coke ovens at Sopris. The company has secured coal lands extending into Huerfano county. F. H. Heath is manager.

SAN JUAN DISTRICT

The heavy snowfalls having closed Animas Forks and Red Mountain to railway traffic, the work on the mines in these districts is confined for the winter to development and creating ore reserves. Indeed, this may be said to be the case in the great majority of the mines of what is known as the San Juan district, excepting, of course, a few whose exceptionally rich ores or proximity to the Denver & Rio Grande railroad, permit their shipment through the winter at a profit. In the mines tributary to Silverton, it is stated that the San Antonio, Congress, Frank Hough, Bonanza, Columbus, Shamrock, Highland Mary, Shenandoah-Dives, North Star and Trilby, will do steady development work all winter. The same may be said of those Poughkeepsee, Gulch, Bear Creek and Sneffels mines which are tributary to Ouray, and by spring an enormous amount of ore will be ready for shipment.

Golden Fleece Consolidated—Lessees on this one-time bonanza mine of Lake City are reported to have made a strike of 18 in. of ore, 8½ tons of which has been shipped and runs 16 oz. gold to the ton. The character of the ore is not given, but is probably petzite, from which a rich output was obtained some years since.

TELLER COUNTY—CRIPPLE CREEK

Stratton's Independence—Results for October, just available, were as follows: Production, 2322 tons, averaging 21 dwt., 19 grains per ton; dump ore milled, 5800 tons; net working profit to the company at the mine from mine and milling departments, $13,000; expenditures on new mine development account, $1150.

El Paso Consolidated—The company has mailed checks for the December dividend of 1c. per share, a total of $24,000, making a total paid to date to the shareholders of $1,163,700. The total production for the last three months to Dec. 16 was about 5000 tons.

Findley—Another good find at 1000 ft. in depth is reported from the Shurtloff mine of this company on Bull hill. The width of the vein is given at 6 ft. and the contents about $30 in gold per ton.

Ajax—Three feet of 3-oz. gold ore is reported from this mine on Battle mountain, worked by lessees.

Vindicator—The Vindicator on Bull hill, which has been a steady producer for many years, is sending out about 2000 tons per month.

Georgia

Pigeon Mountain Iron Company—This company has begun work on the development of a tract of 3500 acres of red-ore land in Walker county. M. T. Singleton, Atlanta, Ga., is engineer and superintendent.

Idaho

BONNER COUNTY

Idaho Continental—The Idaho Continental Mining Company has been reorganized as the Idaho Continental Company. The mine between Priest lake and Kootenay contains high-grade silver. The company plans to build a mill in the spring. The lower tunnel upon which work is now being done will tap the main ledge at 500 ft. depth.

COEUR D'ALENE DISTRICT

Lucky Friday—A shaft will be sunk at the end of the 700-ft. tunnel on the property near Mullan.

Blaine & Emmet—The company has been organized by Charles A. Smith, Amos Watkins, and Roy J. Houghtaling, of Murray, and will operate claims near Murray.

Trapper—The vein on the group of claims situated near Wardner shows a width of 50 ft. at the surface. A contract for an additional 80 ft. of work has been let.

Hercules—The Tiger mill leased by the company ran its first full 8-hour shift recently. Adjustments will be made before three shifts are put on.

Lucky Calumet—Work on the lower tunnel will be begun as soon as the power line from the upper to the lower workings is completed. The machinery, which includes two motors and a five-drill compressor, has already been moved from the upper to the lower workings. The lower tunnel will tap the vein in 1900 ft. and will give a depth of 1500 feet.

Bunker Hill & Sullivan—The company has appealed the case which the United States recently won against it in the Circuit court involving the question of whether the company had the right to cut

timber from a homestead entry which was mineral in character.

Butte & Coeur d' Alene—The vein has been drifted on 60 ft. and carries 2½ ft. of shipping ore and about the same amount of milling ore. The shaft is down 200 ft. and will be sunk another 300 feet.

Valentine—A contract has been let for a 50-ft. extension of the drift now in 750 ft. An assessment of one-half mill a share has also been levied on the stock.

Hypotheek—A recent report to stockholders states that since the ore in the west drift on the 800-ft. level did not improve as the drift progressed, it was decided to discontinue work at that point and sink the shaft 200 ft. This sinking should be completed by Jan. 15 when a crosscut will be run to tap the vein at that depth.

Indiana

Greene County

The Summit mine, in which there was recently a fire, resumed work Dec. 23. The mine has been overhauled, and when it starts it will be in a better and safer condition than when it was shut down. All the other mines in this county are running full time. There is no shortage of cars.

Gibson County

The threatened strike at the Princeton coal mine has been averted by the signing of an agreement by the officials of the mine workers and of the mining company, following a conference. The local coal companies have agreed to pay the miners extra for "sticky top" coal.

Sullivan County

For the first time in five years every coal mine in this county is being operated full time. More miners could be employed but they are not obtainable.

The assessor of the county has completed figures showing that there are 56,872 acres of coal land in the county and the average appraised price is $45 per acre.

Kentucky

Crittenden Coal and Coke Company—A sale has been arranged by R. L. Coffy to a New York syndicate. The sale includes a large tract of coal land around Sturgis, in Union county.

Michigan

Iron

Florence—The company controlled by Ladenberg, Thalman & Co., of New York, is exploring in the western Menominee range near the Delphic mine and on the Hall-Yakel property.

Armenia—The pumping capacity at this property controlled by Corrigan, McKinney & Co., will be enlarged to handle the unexpected water flow. The adjoining McDonald mine of the Huron company is also being unwatered by the Armenia operation.

Iron Belt—This property on the Gogebic range of the Cleveland Cliffs company will be closed owing to exhaustion of the ore.

Minnesota

Iron

Work of drilling the Murray ground near Tower is underway in charge of James Cardle and Paul F. Chamberlain. Work on Pine island will also be done.

Mississippi—The work of opening this mine belonging to the Steel corporation at Keewatin is being pushed. A number of drills are at work.

Missouri

Joplin Zinc-lead District

The greatest lead strike ever made in the Seneca camp was made recently on the Gallemore land in several drill holes. A good strike was also made on the Hotel land adjoining this tract.

The B. W. Realty Company has purchased the 80-acre tract of Charles Schifferdecker in the West Joplin sheet-ground district for $80,000. On this tract are the Paragon, West Seventh Street and Kitty Mack mines.

James F. Gallagher, of Joplin, will erect a 400-ton mill on a 50-acre lease of the Taylor & Glover land in the West Joplin sheet-ground district. Fourteen drill holes and the shaft have demonstrated the ore.

S. S. Bissill, of St. Louis, has purchased a 10-acre lease and mill on the Robb land, south of Joplin, for $20,000.

Athletic Mining Company—J. C. Squires of Joplin and A. F. Dexter of Chicago have organized this company, capital $50,000, and have taken over the Seigfreid mine and mill north of Webb City in the sheet-ground belt. This lease is one of the few on a sliding scale of royalty. The lease is for 20 per cent. with jack at $50 to $60 per ton and 25 per cent. with jack $60 or above.

Morning Hour—This mine south of Joplin, which was one of the greatest soft-ground mines in the district and which worked out under the Frisco and electric railway's tracks and caved them, has resumed operations together with the Big 3 and the railways are building changes of line around the mines.

Rockefeller—The Empire Zinc Company has reopened the mine at Wentworth and is getting the mill in shape to run.

Lima—This 40-acre lease at Prosperity has been sold to Tharp, Potter & Tharp of Webb City for $25,000. A 200-ton mill will be erected.

Samson—William Grower, of Chicago, has purchased for $30,000 the fee of 40 acres of land from Luke & Ash. On this tract is the Samson mine and 400-ton mill.

Nowata Mining Company—This company, W. N. Squires, of Joplin, manager, has purchased a 50-acre mining lease on the Gray land, southeast of Joplin, for $16,000. Eleven drill holes have been put down and two runs of ore developed which are unusually rich.

Montana

Butte District

Davis-Daly—Work is being done on the 1400-, 1500- and 1800-ft. levels, but shipments have been suspended while the Basin concentrator is being fitted up. The management states that shortly, shipments will be begun at the rate of 250 tons daily.

Butte-Superior—The gravity tramway from the shaft to the Great Northern spur, 400 yd., is nearly completed. Work on the spur will be begun at once. Shipments to the Basin concentrator will probably begin in January.

Deer Lodge County

Silver King—Joseph Freudenstein has leased the group of claims, situated at the head of Lost creek.

Jefferson County

Boston & Alta—The recent sale of the Alta mine to this company by the Helena & Livingston company, former owners, has been ratified by the stockholders of the latter company. The sale was made for $200,000, $15,000 being in cash and a note given for the balance, payable Jan. 15, 1911, and secured by a mortgage.

Missoula County

Big Elk—A 50-h.p. boiler, a three-drill compressor, cars and rails have recently arrived. A 30-ft. shaft has been sunk and a lead of 2000 ft. has been opened up. John H. Miles is in charge.

Powell County

Fairview—On the 260-ft. level of the property near Ophir, a 6-ft. vein of rich gold and silver ore has been cut.

Nevada

Elko County

Interest is being turned to the new camp of Contact, about 100 miles north of Ely. Development is underway on several copper properties and much is claimed for the district as a future copper camp.

Esmeralda County

Combination Fraction—The management has decided to sink the shaft an additional 200 ft., giving it a total depth, when finished, of 800 ft. The mine is out of ore, but it is hoped with the new development outlined that the property will again enter the list of shippers.

Goldfield Annex—The shaft of this company has reached 700 ft. and it is the intention of the management to push sinking to 1000-ft. The company holds a lease upon the Polverde claim of the Jumbo Extension company.

Yellow Tiger—A consolidation of the Elk Consolidated Mining and Leasing Company with this company has been about perfected. The Elk company, of which John F. Campion of Denver is president, has spent about $100,000 developing the Yellow Tiger. The basis of consolidation has not been made public, but with the new arrangement there will be a fund of about $40,000 for development. Under the lease the Elk company sunk a three-compartment shaft 770 ft. and also did much lateral work.

Goldfield Mining and Ore Reduction Company—A 25-h.p. gasolene hoist has been installed upon this property at Gold Reef and a 36-ft. gallows frame. Sinking has been resumed and the shaft is 130 ft. deep. The vein upon which this company is working is traceable for 2600 ft. upon the surface. At certain intervals cross veins intersect the main vein and at these points of intersection a good grade of milling ore, some running as high as $30 per ton, is discovered. Marvin Arnold is manager.

LYON COUNTY

Wire Gold—This company is developing at Ramsey, about fifteen miles northeast from Virginia City. An experimental mill is being installed. B. J. Kennedy is president.

NYE COUNTY

The estimated value of the Tonopah production for week ended Dec. 18 is $129,750, the tonnage being divided among the various mines as follows: Tonopah, 3150; Tonopah-Belmont, 620; Montana-Tonopah, 950; MacNamara, 250; West End Consolidated, 130; Tonopah-Midway, 90; total, 5190 tons.

Tonopah—At the meeting of the directors in Philadelphia, Dec. 16, the regular quarterly dividend of 25c. per share and an extra dividend of 10c. per share were declared and made payable Jan. 21 to stockholders of record Dec. 31. This makes the fourth dividend of 35c. per share declared this year, distributing $1,400,000 among the stockholders, and a total to date of $5,300,000. There is still a substantial sum in the treasury and the ore reserves are of such extent that the management expects to maintain the present rate of dividends for an indefinite period. The mill keeps between 95 and 100 stamps dropping constantly. The average grade of the ore is close to $22 per ton with a 90 per cent saving.

Montana-Tonopah—Upon the 565-ft. level the management has been successful in picking up the Triangle vein, which was faulted some distance to the east. The ore in the vein has also improved.

MacNamara—J. W. Chandler, superintendent, submitted his report to the annual meeting Dec. 14 for the year ended Dec. 1. The salient features are as follows: Mined and marketed ore, 16,220 dry tons; average gross value, $22,134 per ton; total gross value, $359,022; average mining cost of ore, $4.58 per ton; average sorting and loading cost, $0.34 per ton; cost of development, per ton of ore sold, $1.69 per ton. Development: Sinking (costing $19.50 per ft.), 315 ft.; all other forms of development, 3119 ft.; total development, 3434 ft.; Cash on hand and cash and ore in transit, $67,335. The report states that the mine is looking better than at any other time in its history. The development work of the past year opened a large tonnage of marketable ore.

Tonopah-Belmont—The full crew of men is now at work in this property, following the shutdown for repairs. The Belmont shaft has attained a depth of 835 ft. below the collar, and is being sunk 15 ft. per week. A raise, from the east crosscut on the 1000-ft. level, is being driven to connect with the above shaft. When completed to the 1000-ft. point, it is the intention to continue sinking until a depth of 1500 ft. is reached.

Pioneer—The shipments from this lease at Bullfrog are from 35 to 40 tons per day. The production for November was $20,000 and the average value of the ore $50.53 per ton. It is estimated the December output will run about $40,000. The ore deposit is an immense lens, faulted greatly, and entirely surrounded by rhyolite.

Mayflower Consolidated—At the annual meeting of the company at Pioneer, Dec. 15, it was decided to lease the entire property for 25 years to the Mayflower Consolidated Leasing Company at a royalty of 5 per cent. on the net profits. The Leasing company agrees to assume the indebtedness of the parent company amounting to $50,000 and to maintain the present efficiency of the mine and mill. Stockholders holding the stock of the parent company can exchange it for stock in the Leasing company by paying an assessment of 2½c. per share. The stock of the Leasing company is assessable and assessments will be levied whenever necessary. Jerry Rourke will be retained as manager of the lease.

STOREY COUNTY

Ophir—The production for the week ended Dec. 18, was 433 tons, assay value $46.40 per ton or a total value of $20,098. A car load of concentrates was shipped to Selby. The three-compartment winze is down 47 ft. below the 2300 level.

C & C—The water in the shaft was held at 148 ft. below the 2350 station. A new throat piece has been placed in the No. 2 elevator and the No. 1 is to be likewise repaired. The two elevators will then be in condition to resume lowering the water in the shaft.

New Jersey

Alpha Copper Company—This company, capital $2,000,000, is developing the copper property on Watchung mountain, near Somerville. J. C. Reiff, of New York, is president. The report to the New York curb market claims $1,555,899 of ore blocked out.

New Mexico

RIO ARRIBA COUNTY

Tusas Peak—This company has installed a pump and hoist and is developing. Col. F. Randall is in charge.

SOCORRO COUNTY

Cooney Consolidated Mining Company—The company organized by Nova Scotians has taken over the Cooney mine 90 miles north of Silver City. The property will be developed.

Oklahoma

King Jack—This mine at Miami has been sold to Pennsylvania parties by Chapman and Lennan. The mine has been one of the best in the camp and the mill was burned down and rebuilt. A deeper run of ore is now being worked.

Omaha-Petersburg—This company has bought the fee of 160 acres including the old M. K. & T. mine at Quapaw and is drilling. The mill is to be enlarged and made over into a modern plant of 250 tons.

Mission—This mill has been completed. Foust jigs have been installed and all the latest machinery and as the mill is of large capacity and the ground well opened up, large results should soon be forthcoming.

Lancaster—This mill recently burned will be rebuilt.

Good Luck—The mine at Quapaw is making the best run of any mine there. The ore will average over 60 per cent. and the dirt is rich.

Heap-O'Brien—The mill has been completed and will add to the production of the Quapaw camp.

Emma Gordon—The tailing mill at Miami is making a splendid run.

New State—A tailing mill has been erected to run the tailings of this mine at Miami.

Mason—This mill at Baxter-Quapaw is ready to run.

Tennessee—This company at Quapaw has completed the sinking of the new shaft.

Oregon

BAKER COUNTY

Humboldt—This gold mine, Mormon basin, is running night and day. John Arthur, Baker City, is manager.

DOUGLAS COUNTY

Continental—This mine will install compressor and drills. W. B. Stewart, Myrtle Creek, is manager.

Pennsylvania

Mill Creek Coal Company—Warren Delano, president of this company, writes us as follows: "Referring to your notice

in JOURNAL for Dec. 18 will you kindly state in your next issue that this company —which has been operating for 20 years as lessee of the Lehigh Valley Coal Company—has arranged to take the entire output of the Buck Mountain and Vulcan collieries and will sell the same hereafter as in the past."

South Dakota

Gold Mountain Mining Company—The company will operate in the Dome Mountain district. J. R. Russell, of Lead, is in charge.

Utah

F. Augustus Heinze is credited at Salt Lake City with "merger" plans concerning the Ohio Copper property and the Mascotte tunnel in the Bingham camp. The Fortuna ground, adjoining the Ohio, is involved in the report and other Bingham areas made more or less tributary to the Ohio by the control of the tunnel.

JUAB COUNTY

American Star—The mine near the Centennial-Eureka has done 1000 ft. of drifting through the Eagle & Blue Bell workings in new territory. A shaft will now be sunk east of the Chief Consolidated. A. U. Holding is manager.

Opex—This property after three years' work during which 2300 ft. of work has been done is reported to have good indications on the 1000 and the 2100 levels. J. Will Knight is manager.

Provo Mining Company—The company has encountered the ore from the level from the bottom of the 300-ft. shaft. It is reported 7 ft. thick with high lead content.

TOOELE COUNTY

Buffalo Consolidated — Connections have been made between the old workings and the widened winze. A 5-ft. orebody was disclosed by the work.

Washington

STEVENS COUNTY

Royal Copper—L. J. Winslow, manager, Chewelah, states that work will be continued all winter. Work will be started on the tunnel at once.

Oriole—This property under charge of Joseph Lancaster, Spokane, is being equipped with a boiler, compressor and drills.

United Copper—This company under the direction of Conrad Wolfe, manager, has spent about $100,000 in developing its property near Chewelah. A compressor and drills are being installed.

West Virginia

Merchants' Coal Company—A mine is to be opened near Reedville, the operations being in charge of J. D. O'Neil, general manager. The company owns about 8000 acres of land, adjacent to the Morgantown & Kingwood railroad.

Orr Coal and Coke Company—The mine and plant at Terra Alta has been sold by the receiver to W. A. Stone, of Uniontown, Penn. He will organize a new company.

Wyoming

Plans are under way for an aërial tramway to connect with the tramway which runs from Rudefaha to Encampment. The spur is to run to Rambler. This will improve the transportation facilities of the West Virginia-Wyoming, Doane and other mines.

United Copper Smelters and Railway Company—This company, successor to the Penn-Wyoming company in the Encampment district, will reopen the Ferris-Haggarty mine in the spring. Nothing is being done now.

Fremont Exploration Company—The company has been financed in Boston and Michigan to develop a property 18 miles north of Shoshone, formerly owned by M. C. McGrath. The property was examined by C. W. Pritchett. of Denver, who recommended an expenditure of $60,000 for development.

Canada

BRITISH COLUMBIA

Hidden Creek—This mine, a short distance from Port Simpson, has been purchased by M. K. Rodgers, of Seattle.

ONTARIO

Lucky Godfrey—In the course of putting down the shaft on a promising silver vein at Elk lake, 65 bags of ore have been taken out. The vein is 4 to 6 in. wide, and yields high-grade ore.

ONTARIO—COBALT

Beaver—A second shipment of ore of 25 tons has been made, which was raised and sacked in 18 days. The vein is showing great strength. The winze sunk 50 ft. from the 200-ft. level proved it to be rich. At the 250-ft. level drifting has been done for 50 ft., proving the orebody on three sides and indicating it to be extensive.

Crown Reserve—The Crown Reserve has distributed $14,000 among its 180 employees as a Christmas bonus. The output of the year is estimated at about 4,000,000 oz. of silver.

NOVA SCOTIA

Barium Production Company — This New York company, operating at Lake Ainslie, has assigned, owing, it is said, to the difficulty encountered in separating the fluorspar from the barytes.

YUKON TERRITORY

Canadian Klondike Mining Company—The past season has been a successful one and the company is in the market for additional machinery. Joseph W. Boyle, Dawson, is manager.

Mexico

CHIHUAHUA

American Zinc Extraction Company—This company of Kansas City is installing an experimental concentration process for treating the Parral zinc ores. The plant is not yet in operation, and the results obtained in the experimental work are not made public. B. D. Rowe is president.

Batopilas — During the first four months' operation of the cyanide plant, to Nov. 30, 1909, 717 tons of second-class concentrates and pan tailings were treated containing 90,406 oz. of silver, of which 87,372 oz. were recovered, or an actual average extraction of 96.64 per cent. The increased saving has been approximately 60 per cent. in treatment costs and over 11½ per cent. in silver contents.

COAHUILA

The Mexican Coal and Coke Company is building 50 coke ovens, and will start work soon on a power plant using steam turbines and generating electric power.

The Agujitas and Lampacitas coal companies have merged into a new company, with 7,750,000 pesos capital, known as La Compañia Carbonifera Agujitas.

DURANGO

Mexican Consolidated—This company, operating at Guanacevi, reports profits for the year to Nov. 1, $350,000. The new mill will start Jan. 1. The ore reserves are reported as $1,795,500, or five times as much as a year ago.

HIDALGO

La Blanca—The contract for the cyanide plant has been let to Barker & Empson, of Pachuca and Mexico City.

Santa Gertrudis—Camp Bird, Ltd., has issued notice of a meeting to be held in London, Dec. 30, to vote on the following resolutions: (1) "That the company hereby authorizes the formation of a separate company to acquire the option over the Santa Gertrudis mine and the subscription of the whole or any part of the capital of such company." (2) "That the capital of the company be increased to £1,350,000 by the creation of 250,000 additional shares of £1 each."

JALISCO

San Pedro Analco—The Manuel Cuesta interests have acquired control of the water power plant on the Santiago river installed by this company. Power for the Hostotipaquillo mines is guaranteed for July 1.

SONORA

Greene-Cananea—Equipment for framing mine timbers, heretofore situated at the entrance of the Capote and Oversight mines, will be transferred to the main timber yard on the mesa.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, Dec. 29—The coal market in the West is reported everywhere active. Steam coal is in steady demand, and the cold and stormy weather which has prevailed over a large area has kept up an extremely active demand for domestic fuel. Orders are being rushed to the mines everywhere, and the only point which troubles operators is the difficulty in getting cars. Car shortage in the West has not been acute by any means, but just now storms have caused some delay in getting cars to the mines, and transportation is slow.

In the East the demand for bituminous coal is improving still, but car shortage and railroad blockades are interfering with transportation and delaying deliveries. The coastwise trade is temporarily demoralized by the Christmas blizzard which caused a number of wrecks, with more to be heard from, probably. It was the worst storm since 1898, and resulted in the loss of some fine coal carriers. Notable among them is the five-masted schooner, "Davis W. Palmer," which is reported to have gone down somewhere near the entrance to Massachusetts bay, with 5000 tons of West Virginia coal.

The anthracite trade is suffering temporarily from transportation difficulties, but is otherwise steady and quiet, with a good demand consequent upon the weather.

Pittsburg Coal Company—The voting-trust question is still unsettled. A new report has it that the buying of the stock is in the interest of the Western Maryland Railroad, the owners of which are planning an extension of the line to Connellsville and Pittsburg. This rumor, however, lacks confirmation. There is also a report that the large block of stock which the Pittsburg owns in the Monongahela River company—the river coal combine—is under option to the Steel Corporation. This also lacks confirmation.

Coal Traffic Notes

Receipts and shipments of coal at Cleveland, O., 10 months ended Oct. 31, short tons:

	1908.	1909.	Changes.
Receipts	4,779,606	5,313,593	I. 533,987
Shipments	3,141,825	2,333,742	D. 808,083

Shipments are mainly by lake. Of the total receipts 133,243 tons in 1908 and 277,699 in 1909 were anthracite.

Coal tonnage of railroads in Ohio Coal Traffic Association, 10 months ended Oct. 31, short tons:

	1908.	1909.	Changes.
Hocking Valley	2,691,554	2,650,165	D. 41,389
Toledo & Ohio Cent.	1,309,875	1,109,519	D. 200,356
Baltimore & Ohio	1,184,887	1,253,547	I. 68,660
Wheeling & L. Erie	2,257,118	2,552,756	I. 295,638
Cleve., Lorain & Wh.	1,996,796	2,066,434	I. 69,638
Zanesville & Western	1,050,341	897,329	D. 153,012
Toledo Div., Pen. Co.	1,278,968	1,509,622	I. 230,654
L. Erie, Alliance & Wh.	870,081	890,832	I. 20,751
Marietta, Col. & Clev.	43,967	64,898	I. 20,931
Wabash-Pitts. Term.	.....	27,152	I. 27,152
Total	12,683,587	13,022,254	I. 338,667

The total increase in tonnage this year was 2.7 per cent. Only the Ohio lines of the Baltimore & Ohio are included above; the main line is given elsewhere.

The Southwestern Interstate Coal Operators' Association reports shipments for two months, September and October, as below, in short tons:

	1908.	1909.	Changes.
Missouri	538,452	471,277	D. 67,175
Kansas	1,028,267	1,020,762	D. 7,505
Arkansas	392,021	428,599	I. 36,578
Oklahoma	598,031	470,147	D. 127,884
Total	2,556,771	2,390,785	D. 165,986

The total decrease this year was 6.5 per cent. The heaviest loss was in Oklahoma.

Including 344,555 tons coal after Dec. 1, the season tonnage of coal passing through the Sault Ste. Marie canals was, in short tons:

	1908.	1909.	Changes.
Anthracite	1,384,743	1,412,387	I. 27,644
Bituminous	8,517,717	8,527,639	I. 9,922
Total	9,902,460	9,940,026	I. 37,566

The total increase was only 0.4 per cent.; a much smaller gain than was expected.

Norfolk & Western tonnage for the 10 months ended Oct. 31, in short tons:

	Coal.	Coke.	Total.
To line points	8,847,589	2,016,103	10,863,692
To tidewater	2,635,319	92,399	2,727,718
Total	11,482,908	2,108,502	13,591,410
Total, 1908	9,153,681	1,571,202	10,724,883

Total increase, 2,866,527 tons, or 26.7 per cent. The tidewater deliveries were 20.1 per cent. of the total tonnage.

Bituminous coal and coke tonnage of leading railroads in Pennsylvania and West Virginia, 10 months ended Oct. 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	18,931,775	3,764,098	22,695,873
Buff., Roch. & Pitts.	5,477,719	396,279	5,873,998
Buff. & Susqueh'na	1,204,464	265,329	1,469,793
Penn. lines, N. Y. C.	6,073,579	79,224	6,152,803
Pitts. & L. Erie	7,930,711	4,441,136	12,371,847
Pitts., Shawmut & N.	742,339	14,367	756,706
Norfolk & Western.	11,482,908	2,108,502	13,591,410
Ches. & Ohio	11,118,863	377,530	11,496,393
Total	62,962,358	11,446,465	74,408,823
Total, 1908	54,708,326	7,181,872	61,890,198

Total increase this year 12,518,625 tons, or 20.2 per cent. In addition to the above the Baltimore & Ohio carried 632,013 tons anthracite in 1908 and 664,999 in 1909; increase, 32,986 tons.

New York

Anthracite

Dec. 29—As for a month past, anthracite is a weather market, and cold weather has brought about an active demand, while storms have made deliveries slow and difficult. There are prospects of a good and steady trade for some time.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b., New York harbor. For steam sizes quotations are, f.o.b., New York harbor points: Pea, $3.10@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50. Some small lots are reported sold at special prices, but not in important quantity.

Bituminous

The bituminous trade along the seaboard is good, and demand continues to develop well, so far as orders are concerned. The far East is naturally quiet, as much of its buying is over for the season. The Sound ports are doing well and all-rail trade is active. In New York harbor trade has resolved itself temporarily into a struggle to get the coal that is wanted; but deliveries are very uncertain for the time being.

The car shortage has been, of course, intensified by the great storm, which struck the railroads throughout this territory pretty hard. Transportation was temporarily blocked, and it will take some days to straighten out the tangle and permit coal to come through in anything like schedule time.

Nominally, quotations are unchanged. There are reports of high prices paid for stray lots in New York harbor that were badly needed. These, of course, are exceptional and do not permanently affect the market. In a week or so, probably, matters will come back to a normal condition.

The coastwise trade is in a state of suspension owing to the storm of Dec. 24-26, which was the worst for nearly 12 years. Cape Cod is reported lined with wrecks of coal-carrying schooners, and it will take some time to ascertain the full damage done.

Birmingham

Dec. 28—Coal output is limited this week by the usual holiday stoppages. These will be made as short as possible, in view of the continued active demand for the product, and inducements are offered to the men to cut short the holidays, by some companies. There is a call for all the coal that can be mined right now. Not only are the manufacturers all busy, but the unusually cold weather has made a big demand for coal for the use of household consumers in this district.

Chicago

Dec. 27—Cold weather continues to make the demand for both domestic and steam coals brisk, with retailers buying largely in the city to provide against the possibilities of a coal famine through transportation troubles. The weather difficulties in the way of the railways have been such as to give rise to newspaper reports of a shortage of coal, and these have influenced many consumers who in turn influence the retailers. But the only marked result of the extraordinary snowstorms yet, has been holding up of prices on smokeless, Hocking and other coals from east of Indiana, because of delayed consignments, Illinois and Indiana coals have been largely in demand in the last week, for all sizes, lump to screenings, and the demand promises to continue active in the week just opening, for the public has awakened to the need of large stores in consumers' bins. Illinois and Indiana bring $2@3 for lump and egg, $1.75@1.85 for run-of-mine, and screenings $1.25@1.45, the high price of the screenings being due to large demand for this size for steam-making purposes and difficulty of transportation.

Hocking continues very strong and in good demand, while Pocahontas and New River have been comparatively scarce, owing to railroad delays, and have brought $3.65@3.75 for lump and 3.05@3.15 for rn-of-mine, these conditions continuing into the present week. Youghiogheny is in good demand at $3.15@3.25 for steam lump, with gas at $3.30. Anthracite sales are brisk, with chestnut continuing scarce and in large demand.

Cleveland

Dec. 28—Steam trade is steady and good. The domestic trade is booming. Cold weather and a shortage in gas supply have combined to give dealers all they can do.

M. A. Hanna & Co., of this city, have arranged to build a receiving dock at West Duluth, Minn., which will be 375 ft. wide by 3000 ft. long and will be constructed of concrete and piling. It will have a capacity of 300 cars a day and will be equipped with the latest electrical machinery both for unloading ships and for loading cars.

Quoted prices for coal, f.o.b. Cleveland, are: Middle district, $2 for 1¼-in., $1.85 for ¾-in., $1.75 for run-of-mine and $1.60 for slack; No. 8 district, $2.15 for 1¼-in., $1.95 for ¾-in., $1.85 for run-of-mine and $1.65 for slack; Massillon domestic, $2.95 for lump and washed nut; Pittsburg, $2.35 for 1¼-in., $2.25 for ¾-in., $2.15 for run-of-mine and $1.75 for slack.

Indianapolis

Dec. 28—Cold weather is the keynote of the coal trade. The belated domestic demand is coming in actively, and dealers in all the cities and towns are rushing orders to the mines. Operators have hard work to keep up with these orders, in addition to supplying the steam trade, which continues good and steady.

Car supply has been good, except where railroad transportation has been interrupted by stormy weather. The railroads have done pretty well so far, and while some complaints are made, they are not loud.

Pittsburg

Dec. 28—The car supply was very poor last week, and is not improved this week, while there is the added trouble of a sharp shortage of men, the men not having entirely recovered from the holiday. Prices are very firm on mine-run and screened coal, while slack is quotable 5c. per ton higher. The supply, particularly of slack, is limited, and sellers generally quote outside prices to buyers of prompt lots who are not their regular customers. We quote prices very firm at $1.15 for mine-run and nut, $1.25 for ¾-in. and 80@90c. for slack.

Connellsville Coke—The coke trade has worked itself into a peculiar position. There is surface adherence to previously quoted prices but it has been made evident that some sellers are willing to make quiet concessions if they can book any desirable tonnages. Thus an inquiry for 5000 tons of prompt furnace coke last week brought out the regular quotation of $2.75, but on negotiation the seller finally secured the lot at $2.50. There appears to have been only one seller at this figure, but others quoted $2.60 and $2.75. This week the market is firmer, as the car supply is very short, but it is probable that as low as $2.60 could be done on a desirable lot of prompt coke. Nothing definite has been done on contract coke, the quoting market remaining at $2.75@2.80. Two meetings were held in Uniontown last week by operators who desired to arrange an understanding that no furnace coke should be sold at less than $2.75, but apparently without final result, and previous experience with such attempts among the operators hardly encourages the expectation that practical results can be obtained by this means. Consumers have not been actively inquiring and have not developed the lowest that could be done. Monday the Pennsylvania railroad notified coke operators that they need not expect more than half the regular car supply, as there was much trouble from the snow, particularly in the East.

The market is quotable at $2.60@2.75 on prompt furnace coke, and nominally at $2.75@2.80 on contract furnace, with 72-hour foundry coke $3@3.25 on prompt and $3.25@3.50 on contract.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Dec. 18 at 452,735 tons, an increase of 14,000 tons over the previous week; shipments at 5237 cars to Pittsburg, 8787 cars to points west of Pittsburg and 993 cars to points east of Connellsville, a total of 15,017 cars, an increase of 2000 cars over the previous week.

St. Louis

The coal market as a whole is stronger and in better condition at the present moment than at any time during the last two years. The market is practically bare of coal and prices are consequently advancing. The car shortage has been so acute during the past two weeks that some of the larger producers in the State were unable to keep up with their contract requirements. There is a heavy movement of freight of all kinds and consequently railroads have more business than they can handle. The terminals around St. Louis are terribly congested and cars are delayed in St. Louis three or four days longer than usual on this account. Owing to the extreme difficulty in getting delivery made a number of the larger plants have been uneasy about their coal supply for the past week and have been buying anything that was offered. It is reported that last night at 12 o'clock 20 of the larger consumers in town had their representatives in one railroad yard trying to get their coal switched into their respective plants. This will give an idea of the conditions that exist here. The railroads as well as large consumers have all been in the market during the past week as they realize there will be a shutdown for about three days on account of Christmas.

The market has advanced until Standard 2-in. lump coal is now bringing $1.25 per ton at mine. The weather still remains cold which makes the demand from dealers continue to be heavy. Carterville coal has also advanced and prices in general are 25 cents per ton higher than prevailed last week.

Every road tributary to St. Louis is now short of cars. Even the electric lines which bring coal from the Belleville mines 20 miles distant are short. These mines nearly always have all the cars they can use. The Illinois Central and

Iron Mountain are practically out of business and the mines on these roads were not able to work more than 1½ days last week.

Standard 6-in. lump or egg held at $1.35 per ton mine or $1.87 St. Louis; 2-in. lump is worth $1.25 per ton mine or $1.77 St. Louis; mine-run is bringing $1 mine or $1.52 per ton St. Louis; 3-in. nut is $1 mine or $1.52 St. Louis; 1½-in. steam nut and pea bring 75c. per ton mine or $1.27 St. Louis; 2-in. screenings 65c. per ton mine or $1.17 St. Louis; ¾-in. pea and slack are 40@50c. per ton mine or 92@$1.02 St. Louis. Most of the activity in the coal market during the last week has been in the Standard coal as this is the coal that can be depended upon to arrive at destination quickly owing to the proximity of the mines.

Staunton, Mt. Olive and Springfield district 6-in. lump is worth $1.60 per ton mine or $2.12 St. Louis; 2-in. lump is held at $1.40 per ton mine or $1.92 St. Louis. Mine-run is worth $1.10 per ton mine or $1.62 per ton St. Louis; 2-in. nut is $1 per ton mine or $1.52 St. Louis.

Carterville coal is now bringing $1.75 per ton mine or $2.42 St. Louis for 6-in. lump or egg; while nut is again being held at $1.50 per ton mine or $2.17 St. Louis. Operators are holding to these prices, which are sure to advance if the weather continues to remain the same.

Franklin county 6-in. lump or egg is $2 per ton mine or $2.67 St. Louis; 3- to 2-in. nut is worth $1.60 per ton mine or $2.27 St. Louis.

The anthracite market is again in a healthy state. Circular is being strictly adhered to. Grate and egg are coming forward freely but are readily being absorbed. Chestnut is very scarce.

Foreign Coal Trade

Nova Scotia Coal—Shipments of coal by Nova Scotia companies, 11 months ended Nov. 30, long tons:

	1908.	1909.	Changes.
Dominion	3,049,091	2,250,386	D. 798,705
Nova Scotia Steel	601,620	734,241	I. 132,621
Acadia	294,409	252,522	D. 41,887
Intercolonial	226,067	232,798	I. 6,731
Inverness	240,871	209,184	D. 31,687
Total	4,412,058	3,679,131	D. 732,927

Total decrease, 16.6 per cent. The loss was due to labor troubles.

Transvaal Coal—The total coal mined in the Transvaal for the 10 months ended Oct. 31 was 3,089,844 tons. Nearly all this coal is used by the Witwatersrand mining companies and in local cities and towns.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Dec. 18: Best Welsh steam, $4.02; seconds, $3.84; thirds, $3.66; dry coals, $3.84; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.22; seconds, $1.86. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New Yok, Dec. 29—While the iron and steel markets, as might be expected at this season, are quiet for the time being there is no lack of underlying strength and activity. Mills and furnaces are busy everywhere, and preparations for increasing capacity and output are reported from many quarters.

In pig iron there is little spot demand, but many inquiries, and the indications are for an increased business as soon as the new year is fairly opened. Prices for the time are rather nominal, but seem to be quite firmly held. The inquiries received are mainly for foundry and basic pig.

In finished material there is talk of some large contracts for structural steel pending. Some good orders for steel rails are also heard of. The aggregate of the last quarter's orders for railroad equipment is large, and more are reported to be coming. Small business everywhere is good.

Steel Corporation Bonus—More than $2,000,000 will be distributed by the United States Steel Corporation as a bonus to its officers and employees, 60 per cent. of which will be in cash, according to the official announcement of Chairman Gary. The bonus was first announced as $1,000,000, but Chairman Gary corrected this in his official announcement in which he said: "The amount is determined, as usual by the annual earnings. The sum distributed for 1909 amounts to a little over $2,000,000. This will be paid 60 per cent. in cash and 40 per cent. in preferred stock at 124, or common stock at 90, in accordance with the wishes of the recipients, so far as practicable and convenient. Also, the usual opportunity will be given to subscribe for 25,000 shares of the preferred stock of the corporation at 124, upon the usual conditions."

Lake Superior Iron Ores—It is definitely settled that there will be an advance on bessemer ores for the season of 1910. The advance is 50c., making the price for Old Range bessemer $5, and for Mesabi bessemer $4.75 per ton, f.o.b. Lake Erie ports. It has also been decided that there will be no change in the base contents, which will remain 55 per cent. iron for bessemer and 51.5 per cent. for nonbessemer ores. The prices for nonbessemers are not yet finally determined.

Baltimore

Dec. 28—Exports for the week included 4666 tons steel rails and 1,042,743 lb. rail fastenings to Guaymas, Mexico. Imports included 22,000 tons of iron ore from Cuba and 5800 tons from Spain.

Birmingham

Dec. 28—The iron market in Alabama is in a dull condition this week, owing to the holidays partly, and partly to the usual period of stock taking and preparing for next year. There are reports of large inquiries, and sellers look for a big business next month. Resale iron is nearly all out of the way, and shipments of iron that have been held in the yards are being completed. Not much iron is in the furnace yards outside of this. The inquiries now coming in are for second-quarter and third-quarter deliveries in next year.

The quotations remain at $14.50 for No. 2 foundry for first-quarter iron. Most sellers expect $15 on later deliveries, but this will not be settled for a week or so. President Maben, of the Sloss-Sheffield company, has just returned from New York and reports most favorable indications for next year.

The Tennessee company is arranging for large improvements at the Ensley steel works next year, and their capacity will be greatly enlarged.

Chicago

Dec. 27—The iron market continues quiet and firm, as is natural for the holiday season when no extraordinary influence acts upon the market. It is the expectation of furnace agents that this condition will continue until at least the middle of January and that small sales for needs actually in sight rather than speculative will obtain until that time. Northern iron continues firmer than Southern, little of it being obtainable for needs of the first quarter, at $18.50@19, with Southern bringing $14 Birmingham, or $18.35 Chicago, on the same class of sales. Some Southern is being sold at 25 or 50c. less, it is rumored, on contracts favorable to the furnaces, but there does not seem to be any tendency toward weakening of Southern generally. Agents are holding up the market by professing not to be inclined to sell at the $14 price for second- and third-quarter business, on the ground that the market is practically sure to strengthen after the middle of January.

Business in nearly all lines of finished iron and steel products continues good, with something of a lull due to the holidays, but every prospect that the activity will continue after the first of the year unchecked. Coke is firm, transportation troubles making supplies irregular but not greatly affecting the market, at $5.50 for the best Connellsville.

Cleveland

Dec. 28—Some sales of bessemer ores have been made at 50c. advance over

last season's prices, and that is now the accepted figure. The prices of nonbessemer ores are not fixed, but they will probably take the same advance.

Pig Iron—Some iron has been taken by pipe foundries; otherwise there is little new business. Makers seem to be weakening a little on prices, and there are reports of shading 10 to 25c. per ton on good orders.

Finished Material—Specifications on contracts continue large, but little new business has been closed. Some large orders for plates and bars are pending. Small trade is exceedingly active.

Philadelphia

Dec. 29—The last week of the year shows the customary quiet and indifference. Very little business has been done. There is no anxiety on the part of buyers as to the immediate outcome. The apprehension of speculative prices on foundry and forge has been largely allayed. At the same time the tone of the market is strong and an optimistic spirit prevails. A renewal of activity is predicted in local pig-iron circles. There does not appear to be much basis for it as so many of the larger users are pretty well covered by contracts. Forge would probably respond better as most mill people have pursued the policy of close buying. Some Southern furnace interests have been quietly canvassing around but are not backing any propositions they may make by concessions. In fact the trend, if there is any, is to stronger prices. Quotations are $19 for Northern No. 2X and 50c. less for Southern; $18 for Northern forge and $18.50@19 for basic.

Steel Billets—The diminution of stocks is the main feature. Much material has recently been called on in anticipation of agreed dates of delivery.

Bars—Not a single feature has developed. Prices are regarded as definitely fixed, and manufacturers regard their position as secure.

Sheets—The mills have been catching up with orders and of late are able to promise earlier deliveries when requested. The larger sheet-iron users are anxious to have their material in their own possession, according to contract.

Pipes and Tubes—Reports from mills point to an accumulation of orders and prospects for further calls.

Plates—The mills are largely oversold. Small buyers have been advised to get their orders in as manufacturers are less able to make quick deliveries. A revival of demand is expected by all well-informed office men.

Structural Material—Quiet conditions prevail in this branch as all urgent necessities have been covered. Small local orders are showing up.

Scrap—Local dealers have arranged for the control of considerable heavy steel scrap and some No. 1 railroad scrap which they will deliver to their customers in January. As a rule mills have enough for current wants either in hand or promised at fixed prices.

Pittsburg

Dec. 28—The iron and steel market is naturally dull at this season, but does not seem to have lost any strength. The opinion has become more general, however, that even should the new year bring forth considerable market activity it can hardly raise the trade to a higher level of prices or productive activity than has already been experienced, for without doubt some of the material shipped in the past few months has been to replenish stocks.

The mills are well sold up; on plates, shapes and bars for from four to five months' production, a large part of the bar tonnage being actually specified; on sheets and tin plates for about the same period, and on wire and pipe products for a considerably smaller period.

Pig Iron—A decided weakness developed in basic pig iron last week, and $17, Valley, was shaded, probably to $16.75, in several quotations and one or two sales. There are reports that two merchant firms in Pittsburg bought 18,000 and 20,000 tons respectively, for forward delivery, at $17 or less. The tonnages are probably exaggerated, but there is little doubt that considerable iron was picked up. This week the market is stronger and it is not certain that any iron could be obtained at $17, Valley; for any extended delivery $17.25 or possibly higher would have to be paid. Bessemer remains pegged at $19, Valley. Foundry iron is extremely quiet and not over strong. It is nominally quotable at $17@17.25, Valley, with forge 75c. less.

Steel—Odd lots of bessemer billets may possibly be picked up at $27, Pittsburg, with open-hearth 50c. higher, but for any extended delivery $27.50 and $28 respectively would probably have to be paid. Sheet-bars are $28.50@29.50, depending on delivery.

Ferromanganese—The market is quiet and possibly not as strong as it was. Prices are quotable at $45@45.50, Baltimore, depending on delivery, the freight to Pittsburg being $1.95 per ton.

Sheets—There is not much new business, but buyers are taking material out well on old contracts, and the market is firm all along the line. Prices remain quotable at 2.40c. for black and 3.50c. for galvanized, with painted corrugated roofing $1.70 per square and galvanized corrugated $3 per square.

St. Louis

The pig-iron market for the last week has been absolutely featureless. No one expected much this week, however, and little business will be transacted until after the holidays. Producers have all the business they need; consequently while the market is dull the situation is entirely healthy. The same prices prevail as heretofore, $15@15.25 per ton f.o.b. Birmingham or $18.75@19 f.o.b. St. Louis for No. 2 foundry.

Foreign Iron Trade

British Iron Production—The British Iron Trade Association reports the make of pig iron in Great Britain in the first half of 1909 at 4,715,679 long tons; which compares with 4,635,851 tons in the first half of 1908 and 4,653,989 tons in the second half. The average number of furnaces in blast during the half year was 313, showing an average make of 15,066 tons per furnace.

German Steel Syndicate—The Stahlwerks Verband reports deliveries for the 11 months ended Nov. 30 as follows: Blooms, billets and other half-finished material, 1,350,779; railroad material, 1,691,125; plates, shapes and rolled material, 1,513,850; total, 4,555,754 metric tons; an increase of 140,855 tons over 1908 deliveries.

German Iron Production—The German Iron and Steel Union reports the make of pig iron in the German Empire in November at 1,119,051 metric tons, an increase of 6422 tons over October. For the 11 months ended Nov. 30 the total was, in metric tons:

	1908.	1909.	Changes.
Foundry iron	1,978,775	2,260,743	I. 281,968
Forge iron.....	585,537	600,394	I. 14,857
Steel pig.....	836,840	1,002,075	I. 165,235
Bessemer pig.....	339,285	374,085	I. 34,800
Thomas(basic)pig	6,976,548	7,504,554	I. 528,006
Total.....	10,716,985	11,741,851	I. 1,024,866

Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys. The total increase was 9.6 per cent.

Metal Markets

New York, Dec. 29—The last week in the year shows a quiet condition in the metal markets for the most part, though more strength is expected to mark the opening of the new year.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1909..	$ 9,379,402	$ 7,034,164	Exp. $ 2,245,438
" 1908..	1,952,574	3,785,705	Imp. 1,833,131
Year 1909..	106,652,236	38,139,557	Exp. 68,512,679
" 1908..	70,889,954	42,213,678	" 28,676,276
Silver:			
Oct. 1909..	4,053,745	4,017,884	Exp. 35,861
" 1908..	4,378,015	3,746,863	" 631,652
Year 1909..	47,342,861	37,258,414	" 10,084,447
" 1908..	43,159,395	34,539,067	" 8,620,328

Exports from the port of New York, week ended Dec. 25: Gold, $1,389,550, to Haiti and Argentina; silver, $601,059, chiefly to London. Imports: Gold, $49,200; silver, $44,117, both from Cuba, South America and Mexico.

Gold and silver movement in Great Britain, 11 months ended Nov. 30:

	Imports.	Exports.	Excess.
Gold	£48,870,125	£43,101,383	Imp. £5,768,742
Gold, 1908	41,539,849	45,197,929	Exp. 3,658,080
Silver	10,844,404	11,557,834	Exp. 713,430
Silver, 1908.	9,588,542	11,804,119	Exp. 2,215,577

Of the silver imported this year, £9,124,510 came from the United States.

Gold and silver movement in France, 10 months ended Oct. 31:

	Imports.	Exports.	Excess.
Gold	Fr. 356,668,000	F.127,679,000	Imp. Fr.228,989,000
1908	789,825,000	18,447,000	Imp. 771,378,000
Silver	122,829,000	105,989,000	Imp. 16,840,000
1908	123,891,000	129,130,000	Exp. 5,239,000

During 1908 France accumulated gold at an extraordinary rate.

Exports of tin from the Straits, 10 months ended Oct. 31, were: United States direct, 14,523; Great Britain, 27,414; Euopean continent, 5272; China and India, 1681; total, 48,890 long tons, a decrease of 2586 tons from last year.

Gold—No special demand developed on the open market in London, and prices remained at 77s. 9d. per oz. for bars, and 76s. 5d. per oz. for American coin. In New York gold continues to go to South America, but none has been taken for Europe yet, though some exports are expected.

Platinum—Just at the moment business is dull, as might be expected the last week in the year. Prices are unchanged at $29.50 per oz. for refined platinum and $35 per oz. for hard metal. Dealers look for good business in January, especially from jewelers, whose stocks are generally low.

Silver—The market continues steady and the prospect for the present is that it will continue so. The distribution of silver in India continues favorable. Continental orders have been in the hands of the London brokers for considerable amounts during the current month.

SILVER AND STERLING EXCHANGE

Dec.	23	24	25	27	28	29
New York	52¾	52⅝	.....	52⅛	52⅝	52⅝
London	24¼	24⅛	.....	.....	24⅛	24¼
Sterling Ex.	4.8775	4.8750	.....	4.8750	4.8750	4.8720

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Dec. 16, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India	£ 8,412,390	£6,521,400	D. £1,890,990
China	641,400	1,885,000	I. 1,243,600
Straits	164,885	114,600	D. 50,285
Total	£ 9,218,675	£8,521,000	D. £ 697,675

India Council bills in London sold at an average of 16.125d. per rupee.

Copper, Tin, Lead and Zinc

Dec.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
23	13¾ @13⅞	13¼ @13½	60⅜	33½	4.70	4.60 @4.65	6.02½ @6.07½
24	13⅜ @13⅞	13¾ @13½	60¾	33⅞	4.70	4.60 @4.65	6.02½ @6.07½
25	.....	.....	....	....	....	.....	.....
27	13¾ @13⅞	13⅜ @13⅝	....	33⅞	4.70	4.60 @4.65	6.05 @6.07½
28	13¾ @13⅞	13⅜ @13⅝	60 13/16	34	4.70	4.60 @4 65	6.05 @6.07½
29	13¾ @13⅞	13½ @13⅝	61¼	34	4.70	4.60 @4.65	6.05 @6.07½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Notwithstanding the holiday season, the copper market has been active and a good business was done both for domestic delivery and export. Prices advanced steadily, and close at 13¾@13⅞c. for Lake copper, and 13½@13⅝c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13¼@13⅜c. for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is fair.

The standard market in London was also strong and advancing and there was a larger turnover than for some time past. The market closes at £61 5s. for spot, and £62 7s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £63 10s.@£64 10s.; strong sheets, £73 10s.@£74 10s. per ton.

Exports of copper from New York and Philadelphia for the week were 5945 long tons. Our special correspondent gives exports from Baltimore at 2163 tons copper.

Tin—The holidays in London, which lasted from Friday of last week until Tuesday of this week, interfered with any great activity in this metal. While on Thursday last the London market suffered under an attack from the bears, it recovered just as rapidly. Apathy among consumers in the United States is still apparent. Naturally, this season of the year, with approaching stock-taking, always interferes with purchases and buyers are also somewhat apprehensive as to future consumption of tin in the United States. They are inclined to believe that it will show a falling off during the next few months. The London market closes firm at £154 for spot and £155 10s. for three months, while tin in this market can be purchased at about 34c. per pound.

Arrivals of tin at Pacific ports of the United States, 10 months ended Oct. 31, were 1934 long tons; 253 tons more than last year.

Lead—The market is strong at last prices, 4.60@4.65c. St. Louis and 4.70c. New York, at which figures there has been a good steady demand.

The London market has advanced further, and Spanish lead is quoted at £13 8s. 9d. and English at £13 11s. 3d. per ton.

Spelter—This metal remains quiet and neglected. There has been little business offering and this has been taken at about last figures. The market closes at 6.05@6.07½c. St. Louis, and 6.20@6.22½c. New York.

New York quotations for spelter on Dec. 23 and 24 were 6.17½@6.22½c.; Dec. 27-29, inclusive, 6.20@6.22½ cents.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The London market is unchanged at £23 2s. 6d. for good ordinaries, and £23 7s. 6d. for specials.

Other Metals

Antimony—The market is dull and prices are nominally unchanged. Cookson's is quoted at 8⅛@8½c. per lb.; Hallett's, 8@8⅛c.; U. S., 7⅞@8c.; with 7⅝@7¾c. named for outside brands.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—The market is strong, and an advance in prices is expected next month. In New York the quotation is $52.50 per flask of 75 lb. for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £9 15s. per flask, with £9 17s. 6d. asked by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 200-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Platteville, Wis., Dec. 25—The base price paid for zinc ore was $48@49 per ton; no premium price reported. The highest price paid for lead ore was $60; the base price was $57@59 per ton.

Shipments for week and for year to Dec. 25: Zinc ore, 1,981,050 lb. week, 134,860,630 lb. year; lead ore, 471,045 lb. week, 9,691,528 lb. year; sulphur ore, 238,456 lb. week, 15,680,366 lb. year. Week's shipments to separating plants, 2,483,470 lb. zinc ore.

Joplin, Mo., Dec. 24—The highest price paid for zinc-sulphide ore was $52, the base $47@49 per ton of 60 per cent. zinc. Zinc silicate sold at $26@28 per ton of 40 per cent. zinc. The average price, all grades, was $46.52 per ton, a general reduction of $1 per ton, or $3 for the month. Lead ore remained steady at $56, and this price was paid for grades ranging from 78 to 81 per cent. metal contents. Average price, all grades, $55.92 per ton.

Nearly all mines close down operations tonight, some to resume Monday, some Tuesday, while some will produce no ore until Jan. 3, utilizing the time in overhauling and repairing the mills. Weather conditions continue unfavorable for the small producers, but the larger mines have increased their production during the month enough to offset any curtailment by the weather. Mines where operations were temporarily suspended early in the month, while making changes necessary to conform to the fuel supply, have resumed and some mines that were idle several weeks during the late fall are again in operation.

SHIPMENTS, WEEK ENDED DEC. 25.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,312,560	610,590	$ 96,597
Joplin	1,755,160	208,890	49,719
Prosperity	612,800	10,070	14,989
Miami	691,880	.....	14,183
Galena	396,840	53,280	11,014
Granby	617,540	13,280	10,945
Duenweg	466,930	.....	10,229
Oronogo	187,840	83,230	8,516
Saginaw	281,520	11,500	6,072
Alba-Neck	242,190	.....	6,054
Carthage	214,050	.....	5,351
Aurora	233,300	.....	5,240
Badger	212,280	.....	5,200
Spurgeon	282,460	15,550	4,916
Cave Springs	196,390	.....	4,713
Quapaw	184,840	.. ..	4,158
Jackson	151,860	4,930	3,624
Carl Junction	92,960	8,730	2,662
Sarcoxie	75,440	.....	1,810
Zincite	29,630	.....	740
Totals	10,238,470	1,020,050	$266,732
The year	590,742,700	87,327,980	$14,534,674

Zinc value, the week, $238,202; the year, $12,152,372
Lead value, the week, 28,530; the year, 2,382,302

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September	37.63	47.70	34.44	44.87	54.59	56.11
October	35.95	49.50	33.28	45.75	52.63	55.02
November	39.13	51.31	35.02	48.29	54.53	53.94
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Dec. 29—The market is very quiet, as might be expected in the closing week of the year. A slight weakening tendency is apparent.

Copper Sulphate—There is little doing, but prices are unchanged at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller parcels.

Arsenic—White arsenic is still quoted at 2¾@2⅞c. per lb. for spot; but it is said that slight concessions have been made, and 2.70c. per lb. can be done for January delivery.

Cobalt Oxide—A great drop has been registered in the prices quoted on this chemical. Where formerly $1.10@1.75 was quoted dealers are generally offering it for 80@85c. now, and it is rather easy to get it at the lower figure. The drop is generally attributed to an industrial clash between the North American Lead and the International Nickel companies. It is expected that the Coniagas Mines, Ltd., of Cobalt and St. Catherines, Ontario, will also soon enter this field as a producer of cobalt oxide, in which event a return to the former quotation is unlikely.

Sulphur—Messrs. Parsons & Petit, New York, report the recent importation of 1700 tons Sicilian crude sulphur by steamship "Sicilia," 1500 tons delivered at Baltimore and 200 tons at New York.

Nitrate of Soda—Spot sells for 2.10c. per lb., but there has been a little weakening in futures, and 2.07½@2.10c. per lb. must be quoted for such deliveries.

Mining Stocks

New York, Dec. 29—On the general stock market attention has been absorbed by the rush with which Rock Island stock was put up 30 points in an hour, only to drop back again later. As is usual in such cases, this episode was followed by a degree of dulness in stocks generally, and the close is uncertain and without definite tendency.

On the Curb copper stocks were active, Miami, Ray Consolidated and Ray Central being the leaders, with considerable gains in price. Other coppers were in fair demand. Cobalt stocks and Nevada gold shares were only moderately in evidence. There was some inquiry for Golden Star.

Lehigh Coal and Navigation, which is only dealt in on the Philadelphia Exchange, was strong and active there. On Monday the directors declared a special dividend of 15 per cent., payable in scrip convertible into stock at par. As the stock is paying 10 per cent. dividends and sells at about $125 per share of $50 par, this is equivalent to at least a 30 per cent. dividend.

Some echoes from the past appeared in an auction sale this week, at which the following shares were offered in one lot: 2160 shares Poland-American Gold, of Arizona; 500 Verde King Copper, of Arizona; 5000 Great Republic Copper and Gold, of Arizona; 1000 Lincoln Gold, of Arizona; 2050 Great Central, of South Dakota; 1200 Little Louise, of Colorado; 500 Argentum-Juniata, of Colorado; 500 Irene Mill and Mining, of New York; 507 Freedom Oil, of Delaware. This total of 13,417 shares sold at $48 for the lot, or an average of 0.358c. per share.

Boston, Dec. 28—Continued weakness in North Butte and Parrot have been marked features during the week. Otherwise strength and good tone have predominated. The trading continues to run to specialties and profit taking has been indulged in to quite an extent, but this has tended to solidify the market. Public interest seems to be increasing and the trading continues to be in large volume. All told, 1910 promises big things marketwise, especially if the long-talked of copper merger is put through. Sentiment on State Street favors the belief that the deal is on and that something definite will be known early in the year.

Lake Copper stock, which had a sensational run, is now on a more even keel and fluctuations are less violent. Lake touched $73.50 for high, closing at $70.75 tonight. Hancock, Ojibway, Keweenaw, Franklin and Arcadian were especially active issues among the Lake Superior stocks, while East Butte, Miami, Arizona Commercial and American Zinc have rendered a good account of themselves in the week's operations.

Miami is up $4 to $26.25 on buying which emanated from New York. North Butte and Parrot have been the exceptions. The former broke $8.25 to $47, recovered to $51, and fell back to $48 again today. The status of this mine is unknown and holders of the stock are much perplexed. Parrot has dropped $8.75 to $19.50 and no definite explanation can be given. Osceola rose $7.50 to $170 on the increase in the semi-annual dividend rate from $4 to $6. Mohawk has risen $3 to $68. Copper Range has advanced $2 to $84.50. By increased dividends from its constituent companies

this holding company will have more income than it did last year.

The Curb has witnessed a broad and active market with materially higher prices for many specialties. Ray Consolidated and Live Oak both made record prices. Cactus, Yuma, Rhode Island Coal and Indiana have also had conspicuous advances.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII			

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766		22.493	
Total	52.864		24.402	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York. Electrolytic 1908.	New York. Electrolytic 1909.	New York. Lake. 1908.	New York. Lake. 1909.	London. 1908.	London. 1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56	12.928	12.93	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	12.700	13.646	13.030	60.139	57.551
November	14.130	13.125	14.386	13.354	63.417	58.917
December	14.111		14.411		62.943	
Year	13.208		13.424		59.902	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	
			Av. year.	29.465	

Prices are in cents per pound.

LEAD

Month.	New York. 1908.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213			13.166	
Year	4.200			13.439	

New York and St Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137		4.987		20.625	
Year	4.726		4.578		20.163	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Dec. 29 Name of Comp.	Clg.
Amalgamated	.89⅛
Anaconda	.53½
Balaklala	‡2½
Braden	4⅞
British Col. Cop.	7⅞
Buffalo Mines	3½
Butte Coalition	28¾
Colonial Silver	½
Combination Fra.	.43
Con. Ariz. Sm.	2⅛
Cum. Ely Mining	9
Davis-Daly	4½
Dominion Cop.	7
El Rayo	2
Florence	2⅜
Furnace Creek	‡.05
Giroux	11
Gold Hill	2
Goldfield Con	8¼
Granby	109¾
Guanajuato	2
Guggen. Exp	255
Hanapah	‡15
Kerr Lake	8⅝
McKinley-Dar.	.89
Miami Copper	25¾
Mines Co. of Am.	.50
Montezu. of C. R.	3½
Mont. Sho. C	1⅜
Nev. Utah M. & S.	1½
Newhouse M. & S.	3½
Nipissing Mines	10¾
Ohio Copper	5
Old Hundred	⅜
Pacific Sm. & M.	1
Silver Queen	.25
Stewart	¾
Tennessee Cop'r.	38
Tri-Bullion	
United Copper	8¼
Utah Apex	5⅛
Utah Copper	59⅞
Yukon Gold	4

‡Last quotation.

BOSTON Dec. 29 Name of Comp.	Clg.
Adventure	6
Allouez	56½
Am. Zinc	39⅞
Arcadian	7
Arizona Com.	49¼
Atlantic	11⅞
Boston Con	21⅞
Calumet & Ariz.	102½
Calumet & Hecla	680
Centennial	37
Con. Mercur	.10
Copper Range	84
Daly-West	8¾
East Butte	14
Franklin	18
Greene—Can	11⅝
Hancock	33
Isle Royal	27¾
Keweenaw	6¾
La Salle	18⅛
Mass	6½
Michigan	‡7½
Mohawk	67
Nevada	26½
North Butte	48
Ojibway	12⅛
Old Dominion	54¾
Osceola	168½
Parrot	19½
Quincy	88
Rhode Island	10½
Shannon	16½
Superior	63½
Superior & Bost.	16
Superior & Pitts.	16
Tamarack	68
Trinity	9¼
U. S. Smg. & Ref	54
U.S.Sm. & Re., pd	53
Utah Con	45¼
Victoria	5¼
Winona	10¾
Wolverine	145
Wyandotte	2⅝

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	48¾
Am. Smelt. & Ref.	103¼
Am.Sm. & Ref., pf.	111⅜
Colo. Fuel & Iron.	50½
Federal M. & S.,pf.	‡87¼
National Lead	88¾
National Lead, pf.	110¼
Pittsburg Coal	28¾
Republic I. & S	4⅜
Republic I. & S.,pf.	104
Sloss-Sheffield	87¼
Standard Oil	‡666
U. S. Steel	90⅝
U. S. Steel, pf.	125½
Va. Car. Chem	56⅛

BOSTON CURB	Low.
Ahmeek	225
Chemung	14
Chino	11¾
Gila	10
Indiana	9
Mason Valley	2
Ray Central	3⅞
Ray Con	26¼
San Antonio	8½
Yuma	1⅞

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Dec. 24 N. of Com.	High.	Low.
Adams	.40	.38
Am. Nettie.	.09	.07
Center Cr'k	2.00	1.80
Cent.C.&C.	87.00	86.00
C.C. & C. pf.	85.00	84.00
Cent. Oil	115.00	100.00
Columbia	9.00	7.00
Con. Coal	19.00	17.00
Doe Run	110.00	100.00
Gra. Bimet.	.35	.30
St. Joe	12.50	11.00

LONDON Dec. 29 Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	1 8 0
Esperanza	2 18 0
Tomboy	1 0 0
El Oro	1 6 9
Oroville	0 10 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS.

Dec. 29.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1.25
Best & Belcher	‡.84
Caledonia	.64
Challar	.28
Comstock	.29
Con. Cal. & Va.	1.55
Crown Point	1.05
Exchequer	.30
Gould & Curry	.30
Hale & Norcross	.50
Mexican	1.70
Ophir	1.90
Overman	‡.67
Potosi	‡.64
Savage	.50
Sierra Nevada	.56
Union	.86
Utah	‡.11
Yellow Jacket	1.15
TONOPAH STOCKS	
Belmont	.60
Extension	.68
Golden Anchor	
Jim Butler	.10
MacNamara	.28
Midway	.16
Montana	.82
North Star	.02
Tono'h Mine of N.	7.43
West End Con	.20
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.10
Blue Bell	.02
Booth	.08
C.O.D. Con	.06
Columbia Mt.	.05
Comb. Frac.	.41
Cracker Jack	.01
Dia'dfield B. B. C.	.01
Florence	2.62½
Goldfield Belmont	.04
Goldfield Daisy	.08½
Great Bend	.03
Jumbo Extension	.11
Kendall	‡.03
Lone Star	.02
May Queen	.04
Oro	.02
Red Hill	.03
Sandstorm	.04

Name of Comp.	Bid.
Silver Pick	.08
St. Ives	.05
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King.	.01
Mont. Shoshone C.	1.25
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely.	8.00
Giroux	11.12½
Greenwa'r Copper	.09
Nevada Con.	26.87½
Nevada Hills	.65
Nevada Smelting.	1.00
Nevada Wonder	.60
Nevada-Utah	1.37½
Penn-Wyoming	
Pittsburgh S. Pk.	.85
Ray Central	3.83¾
Ray Con	27.00
Round Mt. Sphinx	.05

COLO. SPRINGS Dec. 17 Name of Comp.	Clg.
Acacia	.06
C. C. Con	.03½
Dante	.07½
Doctor Jack Pot	.08
Elkton	.68½
El Paso	.63
Findlay	.10
Gold Dollar	.10½
Gold Sovereign	.04¼
Isabella	.19
Jennie Sample	.08
Jerry Johnson	.08¾
Lexington	.48½
Mary McKinney	‡.48
Old Gold	.04
Pharmacist	.03⅛
Portland	.87
U. G. M.	.08⅝
Vindicator	.73½
Work	‡.06½

Assessments

Company.	Delinq.	Sale.	Amt.
Adventure Con. Cop., Mich.		Feb. 1	$1.00
Arcadian Copper, Mich.		Mar. 1	0.50
Chemung Copper, N. M.	Jan. 1	Jan. 2	1.00
Con. Imperial, Nev.	Jan. 11	Feb. 3	0.01
Con. Virginia, Nev.	Dec. 20	Jan. 10	0.25
Exchequer, Nev.	Dec. 15	Jan. 5	0.05
Gordon M. & M., Utah	Jan. 15	Feb. 4	0.002
Hancock Min., Mich.		Feb. 1	1.00
Mineral Flat, Colo.	Dec. 11	Jan. 6	0.01
Mountain Dell Con., Utah	Dec. 21	Jan. 10	0.01
Palmyra G. & C., Utah	Dec. 29	Jan. 19	0.002
Precious Metals M. & M., Cal.	Dec. 27	Jan. 31	0.01
Reindeer C. & G., Ida.	Dec. 31	Jan. 19	0.003
Seven Bros.-Pioche, Nev.	Jan. 15	Feb. 4	0.002
Sheba Gold & Silver, Utah	Jan. 19	Feb. 23	0.05
Sierra Nevada, Nev.	Jan. 11	Feb. 3	0.10
Silver Hill, Nev.	Dec. 23	Jan. 14	0.05
Silver King Con., Utah	Jan. 17	Feb. 5	0.10
Union Con., Nev.	Dec. 22	Jan. 13	0.10
Utah Ideal, Utah	Feb. 1	Feb. 20	0.00½
Winona, Mich.	Dec. 1	Jan. 1	1.00

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

MANUFACTURE of Alumina. Gilbert McCulloch, East St. Louis, Ill., assignor to Aluminum Company of America, Niagara Falls, N. Y., a Corporation of Pennsylvania. (U. S. No. 941,799; Nov. 30, 1909.)

COAL AND COKE

BRIQUETTING — Process of Briquetting Coal. Charles E. Hite, Burlington, N. J. (U. S. No. 941,454; Nov. 30, 1909.)

COAL-PUNCHER-SHARPENING MACHINE. John B. Word and William W. Word, San Francisco, Cal., assignors to Word Bros., San Francisco, Cal., a Corporation of California. (U. S. No. 941,484; Nov. 30, 1909.)

COAL WASHING—Coal or Ore Washer. Ernst Prochaska, Alton, Ill. (U. S. No. 942,461; Dec. 7, 1909.)

COAL WASHING—Improvements in Coal Washing Machines and the Like. E. A. Davies, Trealaw, and Heenan Froude, Ltd., Manchester, England. (Brit. No. 20,759 of 1908.)

COKE HANDLING—Apparatus for Handling Coke. Donald McDonald, Louisville, Ky. (U. S. No. 942,341; Dec. 7, 1909.)

COKE OVENS—Door for Coke Ovens. Willard O. White, Republic, Penn. (U. S. No. 941,398; Nov. 30, 1909.)

COKING PROCESS. Leland L. Summers, Chicago, Ill. (U. S. No. 935,177; Sept. 28, 1909.)

PEAT—Machine for Condensing Peat. Wilbur L. Shepard, Elmwood, Conn., assignor of one-half to Horace J. Wickham, Manchester, Conn. (U. S. No. 940,944; Nov. 23, 1909.)

SEPARATOR—Centrifugal Dry Coal Separator. Alfred Ernst, Pittsburg, Penn., assignor to the Coal and Coke By-Products Company, a Corporation of West Virginia. (U. S. No. 942,251; Dec. 7, 1909.)

COPPER

CONVERTER — Copper-Matte Converter. Elias A. C. Smith, Baltimore, Md. (U. S. No. 942,675; Dec. 7, 1909.)

CONVERTER — Metallurgical Converter. William H. Peirce, Baltimore, Md. (U. S. No. 942,661; Dec. 7, 1909.)

CONVERTER—Method of and Converter Vessel for Bessemerizing Copper Matte. William H. Peirce and Elias A. C. Smith, Baltimore, Md. (U. S. No. 942,346; Dec. 7, 1909.)

CONVERTER HOOD AND FLUE. Almon P. Turner, Copper Cliff, Ontario, Canada, assignor to International Nickel Company, New York, N. Y., a Corporation of New Jersey. (U. S. No. 942,801; Dec. 7, 1909.)

GOLD AND SILVER

AMALGAMATION—Apparatus for Distilling Mercury from Gold Amalgam. William E. Bennett, London, England. (U. S. No. 937,356; Oct. 19, 1909.)

AMALGAMATOR. Herbert A. Corliss, Grants Pass, Ore. (U. S. No. 941,560; Nov. 30, 1909.)

AMALGAMATOR. Merritt F. Lansdale, Denver, Colo., assignor of one-half to Hiram G. Fowler, Denver, Colo. (U. S. No. 941,371; Nov. 30, 1909.)

CONCENTRATOR AND AMALGAMATOR. John I. E. Nelson, Bettles, Alaska. (U. S. No. 942,584; Dec. 7, 1909.)

ELECTRO-CYANIDATION — Process of Treating Ores. John R. Parks, Spokane, Wash. (U. S. No. 940,821; Nov. 23, 1909.)

ORE TREATMENT—Process of Recovering Precious Metals. James H. Reid, Newark, N. J. (U. S. No. 937,387; Oct. 19, 1909.)

PLACER MINING—Apparatus for Washing out Placer Gold. Samuel Rachelman, St. Paul, Minn., assignor to Northern Placer Machine Company, St. Paul, Minn., a Corporation of Minnesota. (U. S. No. 942,663; Dec. 7, 1909.)

IRON AND STEEL

FERRO-ALLOYS — Process of Producing Ferro-Alloys. Edgar F. Price, Niagara Falls, N. Y., assignor, by mesne assignments, to Central Trust Company of New York, trustee, a Corporation of New York. (U. S. No. 942,349; Dec. 7, 1909.)

HARDENING—Method of Hardening and Toughening Metal. Henry W. Partin, Portsmouth, Va. (U. S. No. 937 263; Oct. 19, 1909.)

MANGANESE STEEL—Process of Treating Manganese-Steel Ingots. Winfield S. Potter, Rahway, N. J., assignor to Manganese Steel Rail Company, Rahway, N. J., a Corporation of New Jersey. (U. S. No. 938,892; Nov. 2, 1909.)

MANUFACTURE — Improvements in the Manufacture of Steel and Similar Metallurgical Operations. Alleyne Reynolds, London, E. C. (Brit. No. 14,933 of 1908.)

SLAG CEMENT—Improvements in or Relating to the Manufacture of Cement from Furnace Slag. G. F. Metzger, Manchester. (Brit. No. 15,164 of 1909.)

LEAD

LEAD OXIDE—Improvements Relating to the Manufacture of Lead Oxide. William Eckford, Rhyl, England. (Brit. No. 26,257 of 1908.)

RARE METALS

TITANIUM ALLOYS—Process of Producing Low-Carbon, Low-Silicon Titanium Alloys. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 941,553; Nov. 30, 1909.)

TIN

DETINNING—Process of Detinning Tin-Plate by Means of Chlorine. Hans von Schütz, Wetzlar, Germany. (U. S. No. 940,898; Nov. 23, 1909.)

MINING—GENERAL (Including Machinery)

CONVEYER—Wall Conveyer for Mines. Patrick J. Riley, Hallsville, W. Va. (U. S. No. 942,750; Dec. 7, 1909.)

CONVEYING—Improvements in and Relating to Appliances for Elevating and Conveying Stone, Ores, Coal and Other Minerals and Materials. Robert F. Pechin and Harry S. Pechin, Leicester. (Brit. No. 22,155 of 1908.)

ELECTRIC DRILL. Purd J. Lincoln, Birmingham, Ala. (U. S. No. 942,396; Dec. 7, 1909.)

MINE-DOOR-OPERATING DEVICE. John M. Sausser, Osnaburg, Ohio. (U. S. No. 941,102; Nov. 23, 1909.)

MINER'S LAMP. John Van Liew and Adletia M. Van Liew, Houghton, Mich. (U. S. No. 941,897; Nov. 30, 1909.)

ORE CAR—Car for Transporting Ore or Other Material. William C. Carr, Buffalo, N. Y. (U. S. No. 941,405; Nov. 30, 1909.)

PUMPS—Improvements in Pumps for Mine Shafts. Richard Heidecke and Otto Lellan, Neudorf, Germany. (Brit. No. 24,527 of 1908.)

ROCK DRILL. Herman L. Hibschle, Victor, Colo., assignor to the MacCormack Drill and Manufacturing Company, Cripple Creek, Colo., Incorporated. (U. S. No. 941,251; Nov. 23, 1909.)

ROCK DRILL—Internal-Combustion Rock Drill. Lewis L. Scott, Joplin, Mo. (U. S. Nos. 941,731 and 941,732,; Nov. 30, 1909.)

ROCK DRILLS—Improvements in Rock-Boring Machines. Hermann G. Spengel, Johannesburg, Transvaal. (Brit. No. 20,267 of 1908.)

SHAFT SINKING. George R. Moore, Chicago, Ill. (U. S. No. 941,087; Nov. 23, 1909.)

STADIA-ROD. Julian H. Granbery, East Orange, N. J. (U. S. No. 940,007; Nov. 16, 1909.)

ORE DRESSING—GENERAL (Including Machinery)

CONCENTRATION—Improvements in Apparatus for Washing and Separating or Concentrating Metallic Ores, Minerals and the Like. Charles W. Lyon, Dewsbury, England. (Brit. No. 20,752 of 1908.)

CONCENTRATION—Means for the Concentration by Amalgamation of Values of Metallic Ore Matter. Royer Luckenbach, Colwyn, Penn., assignor to Borindum Extraction Company, a Corporation of Arizona. (U. S. No. 938,676; Nov. 2, 1909.)

CONCENTRATION — Ore Concentrating Table. Thomas W. Scott, Morenci, Ariz. (Brit. No. 23,443 of 1908.)

CONCENTRATION — Ore Concentrator. Charles L. McKesson and Orville S. Black, Colorado Springs, Colo. (U. S. No. 941,251; Nov. 23, 1909.)

CONCENTRATION—Slime-Feeding Device for Concentrators. Joseph B. Green, Wallace, Idaho, assignor of one-fourth to Harvey A. Houston and one-fourth to Henry Lieb, Wallace, Idaho. (U. S. No. 941,918; Nov. 30, 1909.)

SCREENING—An Improved Form of Construction for Reciprocating Screens, Conveyers and the Like. William Bardill, Wantage. (Brit. No. 15,832 of 1909.)

SCREENING—Improvements in or Relating to Machinery or Apparatus Employed for Screening Stone, Ore and Like Material. William H. Baxter, Leeds. (Brit. No. 17,245 of 1909.)

SCREENING — Vibrating Shaker-Screen. Loyd C. Dibert, San Francisco, Cal. (U. S. No. 941,862; Nov. 30, 1909.)

SEPARATOR—Magnetic Separator. Walter B. Moore, Walla Walla, Wash. (U. S. No. 940,266; Nov. 16, 1909.)

SEPARATOR—Ore Separating or Concentrating Apparatus. George F. Godley, Philadelphia, Penn. (U. S. No. 941,634; Nov. 30, 1909.)

SEPARATOR—Sand and Slime Separator and Classifier. Charles Allen, El Paso, Tex. (U. S. No. 942,697; Dec. 7, 1909.)

WASTE ROCK ELIMINATOR—Apparatus for Waste-Rock Elimination. Henry L. Kramer, Kramer, Ind. (U. S. No. 942,083; Dec. 7, 1909.)

METALLURGY—GENERAL (Including Machinery)

BLAST FURNACE for Treating Ores. Herman C. Bellinger, Salt Lake City, Utah, assignor of one-half to G. E. Elvis, Salt Lake City, Utah. (U. S. No. 942,052; Dec. 7, 1909.)

CHARGING APPARATUS — Improvements in Means for Charging Gas Producers and Blast Furnaces. Thomas Elcoate, Stockton-on-Tees, Eng. (Brit. No. 2986 of 1909.)

ELECTRIC FURNACE. Charles A. Keller, Paris, France. (U. S. No. 941,419; Nov. 30, 1909.)

ELECTRIC FURNACE. Frederick T. Snyder, Oak Park, Ill., assignor to Electric Metals Company, Chicago, Ill., a Corporation of West Virginia. (U. S. No. 942,110; Dec. 7, 1909.)

ELECTRIC SMELTING—Method of Working Metals, Ores and the Like. Otto Frick, Saltsjöbaden, Sweden. (U. S. No. 938,752; Nov. 2, 1909.)

LIME BURNING—Process of Burning Lime and Apparatus Therefor. Henry L. Doherty, New York, N. Y. (U. S. No. 938,987; Nov. 2, 1909.)

MELTING FURNACE—Metal-Melting Hydrocarbon-Burning Furnace. Garnet W. McKee, Chicago, Ill. (U. S. No. 940,710; Nov. 23, 1909.)

ORE-ROASTING POT. Frank D. Baker, Denver, Colo. (U. S. No. 942,810; Dec. 7, 1909.)

ORE TREATMENT—Process for Treating Certain Ores. Herbert S. Auerbach, New York, N. Y. (U. S. No. 941,904; Nov. 30, 1909.)

REFRACTORY ORE TREATMENT—Method of Securing the Chloridization of Ores. William Koehler, Cleveland, Ohio. (U. S. No. 942,569; Dec. 7, 1909.)

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—		
Carbons, good drill quality, carat		$50.00@75.00
Carborundum, f.o.b. Niagara Falls, powd	lb.	.08
Grains	"	.10@.17
Corundum	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05½@.06
Emery, in kegs; Turkish flour	"	.01½@.02
Grains	"	.03½@.04
Naxos flour	"	.01½@.02
Grains	"	.03½@.04
Chester flour	"	.01½@.02
Grains	"	.03½@.04
Peekskill flour, f.o.b. Easton, Pa	"	.01½@.01½
Grains, in kegs	"	.02½@.03
Garnet, per quality	sh. ton.	25.00@35.00
Pumice Stone, Am. Powd.	100 lb.	1.25@2.00
Italian, powdered	per lb.	.01½@.01½
Lump, per quality	"	.03½@.30
Rottenstone, ground	"	.01½@.04
Lump, per quality	"	.04@.30
Rogue, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07¾
ACIDS—		
Acetic 28%	lb.	.02⅝
Boric	"	.07
Hydrofluoric, 30%	"	.02½@.03½
" 48%	"	.05½
" 52%	"	.06½
" 60%	"	.08½@.09
Hydrochloric acid, 20° per 100 lb.		1.15@1.50
Nitric acid, 38°	per lb.	.04½@.04½
Sulphuric acid, 50°, bulk per ton.		$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.10
66°, bulk, ton		18.00
Oxalic	per lb.	.07½@.07½
ALCOHOL—Grain 95%	gal.	2.61
Denatured	"	.42@.44
Refined wood. 95@97%	"	.52@.57
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	"	.04⅜@.04½
ALUMINUM—Sulphate, com'l.	lb.	1.50@1.75
AMMONIA—24 deg. lb	"	.04½@.05½
" 26 deg. lb	"	.04¾@.05¾
AMMONIUM—		
Bromide	lb.	.28
Carbonate	"	.08@.08⅜
Muriate grain	"	.05⅜@.06½
Lump	"	.09½@.09½
Sulphate, 100 lb	"	2.60@2.65
Sulpho-cyanide com		.30
" " chem. pure		.40
ANTIMONY—needle, lump	lb.	.04⅜@.04½
Oxide	"	.07½@.08
ARSENIC—white	"	.02¾
Red, Outside brands	"	.07
Saxony	"	.07½@.08
ASPHALTUM—		
Barbadoes	per ton.	50.00@80.00
West Indies	"	20.00@60.00
Egyptian	lb.	.11@.16
Gilsonite, Utah ordinary	per ton.	32.00@40.00
Trinidad	"	20.00@25.00
California	per ton.	25.00@30.00
BARIUM—		
Carb. Lump. 80@90%	lg. ton.	26.00@35.00
Precipitated, 96@98%	"	34.00@36.00
Chloride com'l	ton.	35.00@38.00
Nitrate powdered, in casks	lb.	.05@.06½
Blanc Fixe, dry, bbl	per lb.	.02¾@.03½
BARYTES—		
Am. Ground	sh. ton.	12.00@15.00
Floated	"	17.00@19.00
Foreign floated	"	20.00@23.00
BLEACHING POWDER—35% 100 lb		1.40@2.00
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.		4.10@4.35
BONE ASH	lb.	.02½@.04
BORAX, sacks	"	.03¾@.05
CALCIUM—Acetate, gray, 100 lb.		1.90@2.05
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J	sh. ton.	65.00
Chloride, f.o.b. N. Y	"	11.00@14.10
CEMENT—		
Portland, Am. 500 lb	bbl.	1.50@1.60
Foreign	"	2.25@2.90
"Rosendale," 300 lb	"	.85
(in sacks)	"	.65
Slag cement	"	.75@1.25
CHROME ORE—		
New Caledonia 50% ex. ship N. Y	per lg. ton.	14.00@16.00
Bricks, f.o.b. Pittsburg, per M.		175.00
CLAY, CHINA—Am. common ex-dock, N. Y	ton.	7.00@10.00
Foreign	"	10.00@20.00
COBALT—Oxide	lb.	.80@.85
COPPERAS—Bulk	100 lb.	$0.55
In bbls	"	.65@.80
In bags	"	.60@.75
CRYOLITE (carload)	lb.	.06@.07
FELDSPAR—Ground	sh. ton.	5.00@14.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis	"	16.00
Extra	"	20.00@23.00
Special extra	"	30.00@35.00
FIRE CLAY—F.o.b. St. Louis.		
St. Louis, extra quality	per ton.	5.00
" ordinary	"	2.50
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	ton.	8.00@10.00
Ground	"	12.00@14.00
Foreign crude ex. dock.	"	8.50
FULLER'S EARTH—Lump, 100 lb.		.80@.85
Powdered	"	.80@.85
GRAPHITE—Ceylon.		
Flying dust, finest to best	lb.	.02@.04
Dust	"	.02½@.05
Chip	"	.04@.08
Lump	"	.05½@.12
Large lump	"	.08½@.10½
GYPSUM—		
Fertilizer	sh. ton.	5.00
Ground	"	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. Best	lb.	.01⅞@.02½
German	"	.02½@.02⅝
LEAD—Acetate (sugar of) brown,	lb.	.07⅞@.08
Nitrate, com'l	"	.07½@.08½
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	7.50@8.50
Calcined, powdered	sh. ton.	26.00@37.00
Brick, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.90@1.25
Sulphate (Epsom salt)	100 lb.	.90@1.00
MANGANESE—		
Foreign, crude, powdered:		
70@75% binoxide	lb.	.01@.01¼
75@85% binoxide	"	.01¼@.01½
85@90% binoxide	"	.01½@.04
90@95% binoxide	"	.06½
Ore, 80%-85%	sh. ton.	16.00@32.50
MARBLE—Flour	sh. ton.	8.50@9.00
MINERAL WOOL—		
Slag, ordinary	sh. ton.	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, normal	lb.	.08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.47
Sulphate, single	lb.	.10½@.11
Sulphate, double	"	.05⅝@.08
NITRATE OF SODA—		
100 lb. 95%		2.10
95% for 1910		2.10
96% is 2½@7½c. higher per 100 lb.		
OZOKERITE—best	lb.	.14@.17
PAINTS AND COLORS—		
Litharge, Am. powdered	lb.	.05¾@.06½
English glassmakers'	"	.08½@.09½
Lithopone	"	.03½@.07
Metallic, brown	sh. ton.	16.50@22.00
Red	"	14.00@18.00
Ocher, Am. common	"	8.50..9.00
Best	"	16.00
Dutch, washed	lb.	.02¾@.03
French, washed	"	.01½@.02
Paris green, pure, bulk	"	.17½@.20½
Red lead, American	"	.06½@.06¾
Foreign	"	.08¼@.09½
Turpentine, spirits bbl., per gal.		.58½@.60
White lead, Am., dry	lb.	.05½@.05⅝
American, in oil	"	.06¾@.07
Foreign, in oil	"	.07½@.09½
Zinc white, Am. extra dry	"	.05½@.05⅝
French, proc's, red seal, dry	"	.06¼@.07½
French, process, green seal, dry	"	.07½@.10½
PHOSPHATES—Acid		.55@60c. per unit
*Fla., hard rock 77%		6.50@9.00
land pebble 68%		3.75@4.00
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@4.00
POTASSIUM—		
Bicarbonate crystal	lb.	$.07½
Powdered or granulated	"	.08
Bichromate, Am	"	.07½@.08
Scotch	"	.10½
Bromide	"	.20
Carbonate (80@85%)	"	.03¾@.04
Caustic, ordinary	"	.05½
Elect. (90% KOH)	"	.06
Chloride (muriate), 100 lb		1.90
Chlorate, powdered	"	.09½@.09¾
Crystals	"	.08⅝@.09½
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots	"	18½c.
Less than 5 tons		.20
Kainite, long ton, bulk, 8.50; bags,		9.50
Permanganate	lb.	.09½@.10½
Prussiate, yellow	"	.13@.13½
Red	"	.29@.32
Sulphate (basis 90%)	100 lb.	2.18@2.21
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. mines	per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10@10½c.
Imported, non-arsenical, furnace size, ex-ship, per unit		.12@.12½
Imported, arsenical, furnace size, ex-ship, per unit		.11½@.12
Imported fines, arsenical, ex-ship, per unit		.09
Imported fines, non-arsenical, ex-ship, per unit		10½@11c.

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore for furnace is delivered in large lumps.

SALT—N. Y. com. fine 280 lb.	bbl.	.72@1.13
N. Y. agricultural	sh. ton.	3.80@4.50
SALTPETER—Crude	100 lb.	4.00@4.50
Refined, crystals	"	5.50@7.00
SILICA—		
Ground quartz, ord'ry.	lg. ton.	10.00@15.00
Silex, ground	"	13.00@15.00
Silex, floated	"	35.00@40.00
Lump quartz	"	5.00@5.50
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.33½@.36¾
SODIUM—Acetate	lb	.04½@.05
"Alkali," per 100 lb., 58/48		.80@.87½
Bicarb. soda, per 100 lb		1.00@1.30
Soda, caustic, per 100 lb., 78/60		1.80@2.00
Soda, caustic, powdered		.02½@.03
Salt cake, per 100 lb., bulk		.60
Salt cake, bbl		.65@.85
Soda, monohydrate, per lb.		1.40@1.75
Bichromate	lb.	.05¾@.06½
Bromide	"	.20
Chlorate, com'l	"	.08½@.09½
Cyanide, 120-130% KCN, per 100%		
Carloads (30,000 lb.)	lb.	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	.20
Hyposulphite, Am	"	1.30@1.50
Phosphate	100 lb.	2.10@2.40
Prussiate	"	.08½@.09
Sal soda, f.o.b. N. Y	"	.65@.75
Foreign, f.o.b. N. Y	"	.80@1.00
Silicate, com'l	"	.65@1.00
Sulphate, com'l (Glauber's salt)	100 lb.	.60@.80
Sulphate, com'l, calcined		.65@.85
STRONTIUM—Nitrate	lb.	.07½@.08
SULPHUR—Louisiana (prime) to New York	lg. ton.	22.00 up
To Boston, Philadelphia or Baltimore	"	22.50 up
Roll	100 lb.	1.85@2.15
Flour	"	2.00@2.40
Flowers, sublimed	"	2.20@2.60
Powdered commercial, bags		1.55
Sicilian, extra qual., unmixed seconds, crude brimstone to New York	lg. ton.	$22.00
TERRA ALBA—Fr.&Eng.	100 lb.	.70@1.00
TALC—Domestic	sh. ton.	12.00@20.00
French	"	15.00@25.00
Italian, best	"	30.00@40.00
TIN—Bi-chloride, 50°	lb.	.09¾
Crystals	"	.22@.23½
Oxide, lb	"	.37@.40
URANIUM—Oxide	"	2.20@4.25
ZINC—Chloride sol., com. 20°	"	.02½
Chloride, granular	"	.04½
Dust	"	.06½
Sulphate	"	.02@.02½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as mattesr of private contract.